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On the Insects which destroy the young Branches of the Pear-Tree, and the leading shoot of the Weymouth-Pine.

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[*See Plate.*]

A YEAR seldom elapses without our discovering some new injury, which our trees or shrubs have received from insects. As the forests are removed, the insects, which naturally find their sustenance in the spontaneous productions of the country, attack the cultivated trees and plants; although the latter may be very different from those of the forest, on which or in which they naturally feed.

This remark is confirmed by a fact, which at first surprised me, which is, that the same insect which has almost wholly destroyed the Robinia Pseudo Acacia or locust, in New-England, is also found in the Black-Oak, Quercus tinctoria of the younger Michaux; a tree as different from the Locust in the structure and texture of its wood as any two trees of the country.

For several years past, the ends of the branches of the Pear-Tree have been observed to perish suddenly, insomuch that it has been attributed to lightening. Mr. Lowell believing it was caused by insects, on examining the dead part of the branch, proved the correctness of his judgment. He presented me one of the insects with a part of the branch, which contained it in its perfect state; which is the occasion of this communication.

The branches attacked by this insect are known by their leaves withering and turning brown. This happens in June or

July; the insect has then passed through its pupa or chrysalis state, and acquired its perfect form. As it is only after it has arrived at this period, that it can continue the species, it is probable that it deposites its eggs before the month of August is passed. The egg is probably deposited behind a bud, i. e. between the bud and the stem, and is hatched soon after; the larva or grub eats its way inward through the sap, into the hardest part of the wood.

The piece of a branch which I had, was three years old; it had, therefore, one layer of sap and two of wood. The grub had eaten the inner layer of wood, a part of the medulla or pith, and about half of the second layer of wood, in a circular direction, leaving the alburnum or sap-wood untouched, except at its exit. This is shewn at Fig. 2, which represents the end of the wood at the place where the insect was lodged. The external dark circle represents the bark; the centre, the medulla; the other dark portion is the excavation made by the grub.

The genus to which this insect belongs, is called Scolytus.*

* The first entomologist, I believe, who accurately observed the characteristic traits of this genus, was Geoffroy, in France, who named it Scolytus. Linnæus had before seen several species, which he placed in his genus Dermestes; from which, and, as Geoffroy justly observes, from every other genus, it may be easily distinguished by the peculiar form of its antennæ; (these are shewn in the upper figures at *a*.) The excellent French entomologist Olivier has adapted the name given to this genus by Geoffroy. The insect in question is then a Scolytus of Goffroy and Olivier, but not of Fabricius, who has given this name to a very different insect, and has framed a new genus, which he calls Hylesinus, in which he includes the only species of Scolytus Geoffroy knew. The antennæ of these insects are singularly formed. Those of Scolytus Strobi are shewn, very much magnified at *a*. The first joint is as long as all the rest; at the smaller end they are curved and terminate in a round head, the diameter increases toward the other extremity, the second joint is cup shaped and nearly equal in diameter with the first; the third, fourth, fifth, sixth and seventh, are so short and close that their separations can scarcely be distinguished, they are gradually broader to the seventh, which receives the terminating knob; this is composed of three joints. In the species mentioned by Geoffroy, the third joint forms almost the whole of the knob, which probably induced him to call it clava solida. The labium superius *b* is very small and fringed with bristles; the mandibulæ *c c* are short, thick on the outer edge and pointed, the inner or cutting edge thinner and undulated; there is a small notch below the

Of this genus it is an undescribed species. It is precisely $\frac{1}{10}$ or $\frac{10}{100}$ of an inch in length, $\frac{4}{100}$ in diameter; of a deep brown colour, the legs and antennæ paler and of a rust colour; the thorax in front is rough with small tubercles, which point upward and is studied with erect bristles, as are also the elytra or wing-cases and other parts of the body. The elytra are striated with slightly impressed points, and between the series of points are rows of bristles. The plane of the anterior opening of the thorax, which receives the head, is nearly at right angles with that which joins the abdomen, so that the head is entirely underneath. The eyes are oblong, and the antennæ inserted at their lower and anterior edge. This species may be called Scolytus Pyri.

The mischievous effects of this minute insect are observed in June and July; the dead part of the branches of the pear-tree should be immediately cut off and burnt without delay, as the insects have not then left them.

In examining the leading shoot of the Pinus Strobus, or Weymouth-Pine, I found another species of this genus in the terminating bud. The bud was put into a small phial, and half a dozen of the insects were obtained. Three of these I destroyed in dissecting the heads, to obtain a knowledge of the parts of the mouth, which are represented in the drawing, where *b* represents the labium superius or upper lip; *c*, the mandibles or exterior jaws; *d*, the maxillæ or interior jaws; *e*, the labium inferius or lower lip; *f*, the palpi or feelers; those attached to the maxillæ have four, and those of the lip three joints. The number of pieces which compose the feeding apparatus, will shew in part how complicated a machine an insect is.

This is also an undescribed species, which may be called Scolytus Strobi. It is very minute, being only $\frac{6}{100}$ of an inch in length, a little more than $\frac{2}{100}$ in diameter, and is therefore

point. The maxillæ *d d* are torose and rounded on the outer part, and truncated on the top of this part, to receive the palpi; the inner part thinner and fringed with about eight awl-shaped, slightly curved, oblique teeth, with bristles intermixed. The palpi *f f* are conical, consisting of four joints, the lowest much the largest, the uppermost very small. The ligula or labium inferius *e* is narrow somewhat ovate, set with bristles, its palpi *f* conical and of three joints. The mandibulæ and maxillæ are shewn as seen on the inner side.

more slender in its structure than the former species. It is black and polished, the feet pale brown, the antennæ dusky. The Elytra are set with short bristles in longitudinal rows, the thorax with longer ones and more dense, the front of the thorax roughened with prominent points.

I am uncertain whether this insect attacks the terminating bud before the parts below it are infested by the insect, which attacks the body of the leading shoot. Olivier describes twenty-three species of this genus, most of them European, four North American. Besides the two mentioned in this paper, I have four other undescribed species in my collection, which were taken in the District of Maine, and probably many more will be discovered, as the different trees of the country shall be more particularly observed.

One of the most beautiful and the loftiest of the evergreens of New-England, is the Pinus Strobus, the White or Weymouth Pine. The straightness of its trunk is one of its beauties, as it brings to mind the recollection of its utility in masting and for other important purposes. It has been known to acquire the height of 140 or 150 feet, and a diameter of more than seven feet and an half at its base.

The lofty stature of this tree depends upon the constant health of the leading shoot for a long succession of years. If the leading shoot is destroyed, the trunk can rise no higher, although it may happen that in the circle of branches immediately below it, one more vigorous than the rest may be forced by those on each side it, into a more ascending direction, and become a kind of leading shoot; yet the tree is deformed.

It has been observed that in many of those which are cultivated in ornamented grounds and gardens, the leading shoot is destroyed. This is the work of insects, especially of a species of weevil. The species which is so injurious to the White Pine, is, I believe, pretty generally diffused over our country and is undescribed. I have seen it often and in many places, but knew not till the last year, the particular task assigned it in the economy of nature. It is a species of Rhynchænus of Fabricius, a genus which constituted a tribe of the Curculio of Linnæusit; is about $\frac{3}{10}$ of an inch in length. The ground-colour of the shelly coat and legs is brown, and covered with brownish and rust-coloured scales, with white ones scattered

among them, which give it a reddish grey or a kind of roan colour. The thorax is darker, the elytra more rust-coloured. The head is lengthened out into a horny proboscis, at the end of which the feeding apparatus is placed. These are shewn much magnified in plate 2, where *a a* represent the mandibles as viewed on the inner side; they are externally rounded, internally marked with two excavations, the edge cut into three large bluntish teeth. *b b*, The maxillæ torose or swollen toward the base, crowned with conical palpi (*p p*) of four joints; on the interior edge divided into about eight short, curved teeth and set with bristles; below these a tuft of strong bristles, which turn upward or toward the points of the maxillæ. *c*, The ligula somewhat squared and terminated with two conical palpi (*p*) of three joints. There is no labium superius that I could perceive. The head with the snout is about as long as the thorax; the antennæ of about the same length, the first joint is largest forming nearly half the length of the antennæ, the other ten are shorter, the three last of these thicker, forming an oval knob; each of these joints is fringed with short white scales. The eyes are small, lateral, at the base of the snout; the head is small and received by the thorax, which is narrowed to fit it. The thorax is then enlarged, but is not so broad as the back across the wing-cases; in the middle of the thorax are two small white dots, which form a triangle with a white spot behind them at the junction of the elytra. The elytra are striated or furrowed, but very lightly and are covered with small scales, pretty closely set, those of a rust-colour are the most numerous; the elytra are suddenly narrowed toward the ends; a little before this contraction is an irregular white blotch on each. The feet are all nearly of equal length without spines and scaly. Fig. 2 and 3 represent the Rynchænus Strobi, or White Pine Weevil of its natural size and magnified.*

This description is sufficient to distinguish this from all the other species hitherto known. The insect is so small that it is impossible to detect it in the act of depositing its eggs, which are probably placed under the thin skin or epidermis of the

* In technical language, it may be called Rhynchænus Strobi, femoribus muticis, rufo-griseis; thoracis punctis duobus, scutello, maculaque versus elytrorum apicem, albis.

shoot. I suspect that the larva remains in the wood more than one year, and that the shoot dies the second year after the eggs are placed in it. The larva is a soft white grub, with only the head shelly, and armed with strong mandibles.

When the feeding state is passed, and before the pupa state comes on, it prepares an exit for itself by opening a passage outward, but leaves the exterior skin of the bark untouched, so that it is perfectly secured from any injury by rain. The pupa remains quiet for a time, and the perfect insect has only to cut away the epidermis to escape.

The perfect insects begin to come out early in September, and continue to leave the wood through that month and a part of October; the shoot at that time is pierced on all sides with small round holes, sometimes thirty or forty may be counted in one shoot. But an unlimited increase is not permitted to this destructive insect, if it were, our forests would scarce produce a single mast.

One of the means provided by the Creator to restrain the increase of the White Pine Weevil, is a species of Ichneumon, which deposites its eggs in the body of the larva of the weevil, and is furnished with an instrument precisely adapted to this purpose. It is a small four-wingedfly 3½-10ths or $\frac{7}{20}$ of an inch in length, exclusive of the antennæ and the sting. The sting is about as long as the body, the antennæ about $\frac{2}{3}$ that length. It is a full shining black; the abdomen consists of eight segments, the second, third, fourth and fifth are marked with a tubercle on each side; the first and second pair of feet are dull yellow, the third pair dusky brown; the nerves of the wings at the base, or at their union with the thorax, white; the antennæ are wholly of a dusky black colour; the sting is contained in a sheath formed of two semicylindrical valves; it consists of two pieces exactly alike and exquisitely pointed; it answers the double purpose of making an aperture to receive the egg, and of conducting it into the body of the grub. The parent fly is indued with sagacity to discover the individual which is conveniently situated, and within reach of its sting. The larva of the Ichneumon consumes that of the Weevil, which affords it a sufficient quantity of food to complete its growth; it then encloses itself in a thin covering analogous to the cocoon of the silk-worm, passes through the pupa state within the wood, and makes its escape in its perfect form.

The first shoot I examined was cut in August the last year, about the fifteenth. In order to examine it thoroughly, I broke it into pieces of two or three inches in length, and divided these pieces lengthwise with a penknife; I found some of the inhabitants in the larva form, others in different degrees of maturity in the pupa state, some of them nearly perfect. In one of the pieces I observed some other larvæ, which were those of the Ichneumon. This piece I carefully bound together again, and laid it in a small tight box; in the mean time my attention was called to other affairs, and the box was forgotten for several months; when on opening it, I was much gratified to find two Ichneumons, one of which accompanies this communication.

I know not when this insect places its eggs in the grub, nor when it comes forth in the winged state; my object being rather to know what it was, than the time of its appearance. The knowledge, however, that such an insect exists, and the use to which it is destined in the arrangements of providence, may excite our admiration of the wisdom, and our gratitude for the goodness which governs the creation. But the Ichneumon cannot destroy the species, nor can man himself; the most effectual remedy then in our power is, to cut off the leading shoot in August, or as soon as it is perceived to be dead, an inch or two below the dead part, and commit it to the fire.

December, 1816.

ON THE FIELD CULTURE OF VEGETABLES, AS FOOD FOR CATTLE IN WINTER.

BY HON. JOSIAH QUINCY, ESQ.

[To the Corresponding Secretary.]

Boston, December 22, 1816.

SIR,

THE importance, in a northern climate, like ours, of encouraging a general attention to the field culture of vegetables, for the purpose of obtaining an ample and cheap supply of succulent food, for the support of our cattle during our long winters, seems to be more considered than it was formerly. Some

farmers begin to make trial of the system, upon a small scale, and others to admit its advantages. Among vegetables, also, the carrot is deemed very generally, I believe, both in Europe and America, to combine more advantages than any other, considering the quantity and quality of its produce, and the effect of its cultivation, in deepening, cleaning, and ameliorating the ground, and in making the best preparation for subsequent crops of grain and grass. All this is familiar, and seems to be agreed by all farmers acquainted with the subject.

A prejudice, however, prevails against carrot cultivation, from an opinion of its expensiveness. The trouble of keeping clean a small bed of carrots, in a garden, and the labour requisite for that purpose, in the way it is usually conducted, leads farmers to imagine that the cultivation of them, upon a large scale, cannot be carried on without an expense, which will be, at least, a balance for any advantages that may result.

In order to put this opinion to a fair test, and as far as experiment would do, contravene this prejudice, so universal and so injurious to this species of cultivation, I selected in the spring of this year, two pieces of land, and caused an accurate account of the labour bestowed upon them to be kept. The result, as well as the mode of conducting this experiment, I shall state, in conformity to the wishes of the Trustees. In the mode, I do not pretend to any novelty, but it is not possible to give a correct idea of the expense of the cultivation, without stating the manner in which it was conducted.

In the spring of this year, I selected two pieces of land, each containing, by measurement, three acres and one fourth; in the whole, six and a half. They were situated in different parts of my farm. One piece had been cultivated the preceding year, (1815,) with potatoes, and with an ordinary quantity of coarse manure. The soil of this piece was a light loam, a little inclining to sand. The other had been cultivated the same year, (1815) by having had carrots raised on two acres of it, and on the residue, indian corn, and had been manured as is usual for such crops. The soil of this piece was, for the most part, a deep loam; a part, however, inclined to gravel. Both pieces had been suffered to remain during the autumn of 1815, and the winter succeeding, in the same state, in which they were left, when the crops of that year were taken off.

In the beginning of last April, I ploughed both pieces with *a heavy plough and six oxen;* the plough carrying a furrow of at least *twelve inches deep.* The land was then harrowed level. Next, *fifty-nine buck loads* of well rotted manure of the farm yard, was carted on each peice; equal to about *eighteen loads to the acre.* This was spread equally over the surface, and immediately ploughed in with a light plough (carrying a furrow of about six inches,) and four oxen. Both pieces were then well harrowed.

The next process was to strike the land into ridges. This was done by a double mould plough, running with four oxen, and laying the ridges about *two feet apart,* from center to center. The ridges were then trimmed and flattened with hand rakes. After which, the seed was sown by a drill machine, which sowed one row upon each ridge. The seed having been previously thoroughly cleaned and made smooth, by being rubbed by the hand, and winnowed. The quantity of seed sown upon both pieces, was something less than *four pounds.* The whole was finished early in May.

About the 20th of June, the first weeding commenced, and terminated the 4th of July. The second weeding began on the 15th of July, and was continued occasionally, until the 20th of August, at which time it was finished.

The weeding was done by a light garden plough, drawn by two men, and directed by a third, by which the sides of the ridges were thrown off from the plants, as near as possible, without doing them an injury. The plants were then weeded and thinned by hand. The person weeding, using occasionally a light weeding knife, affixed to a long handle, by which the edges of the ridges might be pared nearer to the plants than they could be by the plough; and thus the labour of weeding by hand, was, in a degree, farther diminished. After the weeding was finished, the earth which had been thrown off into the furrows, was returned to the ridges, by the means of the same garden plough.

The harvesting commenced on the 15th of October, and terminated on the 28th of the same month.

This was done by men passing down the ridges, and starting the carrots with dung-forks. Other men followed, who pulled and cut the carrots, throwing the roots into heaps on the

ground, and the tops into baskets. The tops were thrown into carts and given to my cattle, or spread upon grass land, in order to dry, for the purpose of fodder. The roots were thrown into carts, and at once deposited in the cellar. This was the whole process.

Some spaces having occurred, in which plants were missing, either in consequence of the too great heighth of the ridge, whereby it happened that the seed was washed into the furrow, or owing to the failure of the seed, or of the machine, or to carelessness in weeding. These spaces were sowed with turnip seed, in the latter end of July. This is done with great facility and exactness, however numerous, or however small those spaces may be, by means of a very simple instrument. A tube, made of tin, capable of holding two or three ounces of turnip seed, and having a nozzle, or little spout, with an aperture so small as to be just sufficient for a single turnip seed to pass at a time, is fixed to a small garden hoe, so as that the nozzle shall be in a straight line with the flat part of the hoe. To work with facility, the hoe handle ought to be at least six feet long, so as to go under the arm-pit, and give a firm purchase to the hand. The person using it, slightly strikes the spot with the hoe, and by a simple turn of the wrist, drops the seed from the nozzle, into the opening, and by another stroke with the hoe, covers the seed. The great advantage of this instrument is, that the seed is sown just where it is wanted, without stooping, without any fumbling after seed, and so rapidly, that it is done almost as fast as a man can walk. One man, by means of this instrument, sowed in eight hours, all the missing spaces of three acres and a half, and from which I harvested *one hundred and thirty-five* bushels of turnips.

The labour on the above pieces, including that of men and oxen, reckoning that of a yoke of oxen equal to the labour of a man, was as follows :

On the first mentioned Piece.		*On the second Piece.*	
First ploughing,	12½ days.	First ploughing,	13 days.
Second do.	4½	Second do.	5
Twice harrowing,	3	Twice harrowing,	3
Carting out manure,	8	Carting out manure,	6½
Amount to next page	28	Amount to next page,	27½

Amount from last page,	28
Spreading do.	2
Striking out ridges,	5½
Raking,	3
Sowing carrots,	1
	39½ days.
First weeding, from the 2d July to the 4th,	14½
Second weeding, from the 25th July to 20th August,	20
	34½
Labour in harvesting, including that of both men and oxen, to the putting into the cellar,	42
Total labour on this piece,	116 days.

The product of this piece, was—

704	bushels of Carrots,
135	do of Turnips.
839	Total.

Amount from last page,	27½
Spreading do.	1½
Striking out ridges,	6¼
Raking,	4
Sowing carrots,	2¼
	41½
First weeding, from the 20th June to the 4th July,	23
Second weeding, from the 15th July to the 7th August,	41
	64
Labour in harvesting, including that of both men and oxen, to the putting into the cellar,	64½
Total labour on this piece,	170 days.

The product of this piece, was—

1613	bushels of Carrots,
110	do. of Turnips.
1723	Total.

In addition to the above, I had *sixteen tons* of carrot tops, ascertained both by the number of waggon loads, and estimated, also, by weighing a sufficient number of tops, cut from a bushel, to fix an average, and thus ascertain the whole quantity. I have no doubt the amount was greater; but I set it down *at sixteen tons*, as an amount on which I have no question.

The general expense of the cultivation, then, was—

On both pieces, 286 days work, estimated at a high average rate of wages, at $1,	$286 00
Rent of 6½ acres of land, at $4,	26 00
Four lbs. of carrot seed, at $2,	8 00
Expense of sowing turnips,	2 00
Whole expense,	$322 00

For this expense I harvested 245 bushels of turnips, and 2317 of carrots; equal in the whole, of both kinds, to *twenty-five hundred and sixty-two bushels, besides sixteen tons of carrot tops.*

If the carrot tops be estimated only at $3 the ton, and the value cannot be less; and if the amount, $48, be deducted from the whole expense, and the balance, divided by the whole number of bushels harvested, the result will be that the whole expense of the cultivation was *less than eleven cents the bushel.*

In this estimate I have not made any account of the value of the manure, because it was common barn-yard manure, made on the farm, and because the state of the land, after the crop was taken off, not only from the high cultivation in which it was left, and the little exhaustion from the crop, was, in the opinion of judicious farmers, a full compensation for the value of that article. If, however, any one think that the whole value of the manure ought to be charged to this crop, let him add one hundred and eighteen dollars, valuing it at a dollar the load, and he will find that the whole expense of the cultivation, manure included, will be *fifteen cents the bushel.*

I have been thus minute, because I deem it extremely important to counteract the opinion of the great expensiveness of this cultivation, compared with its product, when conducted upon a large scale. I ought to observe, also, that this experiment, although, as I apprehend, it is sufficiently satisfactory, is far from being a just criterion of the real productiveness of this cultivation, compared with its expense.

In the first place, this experiment was conducted with no particular regard to economy. My only care was that the labour actually applied should be ascertained. The work was, in a great measure, done without personal superintendance. A farmer, labouring himself, and present, at all times with his workmen, would, of course, do it better, and in a shorter time. Besides, the product was very far from being as great as might reasonably be expected in ordinary seasons. The first piece being on an upland, and rather on a sandy soil, was checked by the uncommon drought of the last summer. The other piece suffered also from the same casualty. The weeding, by a hand-plough, rather than by an ox-plough, and the loosening the carrots, at the harvesting, by forks, rather than by a plough, which circumstances happened to render to me this year expedient, all added to the expense. I have no doubt that if the season had been favourable, and the whole had been conducted by an active, intelligent farmer, leading his own labourers, that

the product of these six acres and a half would have been between three and four thousand bushels, and the expense of cultivation, exclusive of manure, would not have equalled *nine cents the bushel.*

Two or three principal farmers in my vicinity, satisfied by my experiments in former years have tried the same cultivation with such success and satisfaction, for the two seasons past, on a scale not exceeding half an acre, as to lead them to purpose continuing and enlarging it. They agree that the expense, compared with the product of the cultivation, is not greater, if so great as that of potatoes. The value of the product, as a food for stock in the winter, is far superiour, it is agreed on all hands. Other farmers in this vicinity, also, have assured me that satisfied with the result, they are preparing the next year to make trial, on their own farms, of the field culture of this vegetable.

I am, Sir, yours, &c.

JOSIAH QUINCY.

ON THE ROW CULTURE AND HORSE HOE HUSBANDRY.

[The practice of sowing *broad cast* for grain crops is, we believe, general throughout this Commonwealth. Why it is preferred to the *row culture* it is difficult to conceive. If because the latter requires more labour in preparing the soil for the seed, and more afterwards in the care of the growing crop, this objection will vanish upon a fair consideration of the merits and defects of the two kinds of husbandry. The following summary of the advantages of sowing seed in rows instead of scattering it *broad cast* may induce the reader to look into the subject more at large—we promise him much satisfaction in the perusal of the subjoined extracts from the Farmer's Calendar. This work is from the pen of an Englishman, and, being addressed to his countrymen will be found to contain some terms and to allude to some local peculiarities in husbandry, not known or not familiar to our farmers. The part however which might, properly, be omitted is very small.]

SUMMARY OF THE ADVANTAGES OF THE ROW-CULTURE.

1. Superiour quantity and quality of product, with considerable saving of seed.

2. Perfect command of the land under culture, for any needful purpose, of hoeing, weeding, dressing, thinning, gathering, &c.

3. The most precious opportunity of the total ERADICATION OF THE WEEDS, of applying the whole strength of the soil to the growth of useful vegetables, of keeping it in constant heart and condition, and of superseding the necessity of change, or of particular courses of crops.

4. The power of depositing the seed at its proper depth, securing it from birds, insuring a more regular and certain crop.

5. The benefit of tillage while the crop is growing, by which the soil is *fallowing* for a future crop; this benefit is also of the utmost importance to the growing crop, in hot and dry summers, securing to its roots all the moisture descending from the atmosphere in dews, which in such seasons are very copious and constant.

6. Little or no danger of the crop lodging or falling, the weight of the ears being supported by the strength and shortness of the straw, which is further strengthened by earthing up in the last hoeing.

7. Less danger of blight and mildew, and opportunity of gathering separately, and at a small expense the ears, which may chance to be blighted.

8. Less charge at harvest, and less danger, there being no green weeds.

9. The necessity of a tillage superior to the common, a circumstance of the most beneficial tendency in slovenly and ill-tilled districts.

10. A delightful and garden-like neatness, which must be highly gratifying to the proprietor of the soil, both creditable and profitable to the cultivator, and honourable to the agriculture of the country.

THE ROW-CULTURE.

THE cultivation of corn in rows, for the purpose of admission to destroy the weeds, by one of those seemingly strange revolutions in human affairs, now styled the New Husbandry, is, in reality, the primitive practice, and derived from the most remote antiquity. There needs no better proof of this, than the existing practice of various nations in the east, where, it is well known, they have ever retained the customs of their an-

cestors, with the most superstitious veneration, and, where according to the most authentic records, no change in their agricultural system has obtained for thousands of years. According to the latest accounts, they both drill and dibble their corn, of every species, in Arabia, China, and Japan; in the latter of these countries they use a drill-barrow, of very simple construction, drawn by hand; and in three points, the most important in the whole range of the husbandman's art, I fear they are at least a century before this boasted seat of improvements; they cultivate their whole country, even to the summits of the hills; they collect, with unremitting attention, every possible article of manure, and they suffer not the existence of a weed upon the surface of the earth. The Belgic districts, on our own continent, justly boast a similar superiority over us.

The drill-husbandry has been probably known, and practised by individuals of this country, for ages; but was first essayed upon a regular and permanent plan, about a century since, by the learned JETHRO TULL, who professed to have caught the idea from the vine-culture upon the continent, and to whose ingenious mind the mechanism of an organ suggested the rudiments of an implement for the delivery of seed in drills. In the course of thirty years culture of his own grounds, under every disadvantage of ruined health and embarrassed circumstances, this enthusiastic and splenetic genius, reduced the tillage, seeding, and weeding of land, to a system, which being founded in nature and philosophical truth, we may venture to predict, no length of time will be able to overturn. Most of our drilling and hoeing implements, are either copies, or improvements upon the invention of Tull; and his book, in which theory and practice are properly blended, evincing the labour of an acute and penetrating mind, ought to be in the hands of every agriculturist, who aims at principles, and who is laudably ambitious to take his draught of science at the fountain-head. The grand error of Tull, has not always been fairly, or accurately stated. He no where denies, that dung is an improver of land; but with that inequality of reasoning, generally to be observed in men of strong prejudices, he weakly attempts to support the fanciful notion, that dung acts merely by dividing the soil, without being, in any sort, the food of plants, which quality he attributes exclusively to earth—as if dung, to go no

farther, was not naturally and spontaneously convertible to earth. It is extremely probable, this notion of Tull, was the pure offspring of his spleen. Like too many other cultivators, he had no knowledge at all of cattle. His pride took the alarm at the vulgar occupation of a grazier, although not sharp-sighted enough to perceive any derogation in the business of a mechanic. Such things are hobby-horses. A late writer has drawn, as he supposes, powerful arguments against the drill-husbandry, from the ill success, in pecuniary affairs, of Tull, without reflecting, that a man of genius, may just as easily broadcast, as drill away his money. But whatever were his defects, it would probably be difficult to name a man whose works have conferred a more solid and permanent benefit upon his country; yet whilst so many others, for services of a very different nature and tendency, have enjoyed the most splendid rewards, Jethro Tull, whose honest labours were to contribute to the feeding, and the employment of countless millions, was suffered to pine out his days in misery and distress; his reward consists in the glory of being hailed by posterity, as *the illustrious father of the horse-hoeing husbandry*.

Dibbling, or setting corn in the earth, grain by grain, was known long ago in this country, and practised early in the last century, but laid aside; about thirty years since, the practice was revived by Mr. Varlo, author of the Yorkshire Farmer, and has spread considerably in Suffolk, Norfolk and Lincolnshire.

To a man unacquainted with the proverbial aversion of the generality of English farmers, to all improvements, and their rejection of the most obvious benefits merely on the account of their novelty, the slow progress of the row-culture, with its perfections staring even indolence itself out of countenance, would indeed seem somewhat miraculous. But what conclusions are we to form from a perusal of the works of certain of our most profound writers on agricultural topics, where they tell us, with so much apparent gravity, that we may, or rather must drill or dibble pulse; but that we may not *drill* white corn, and yet notwithstanding, we may *dibble* white corn! Out of respect to those gentlemen, from whose writings I have received so much instruction, I shall suppose they have argued in this way, from pure complaisance to the majority, whose hour or minute of conversion was not arrived, who were not yet bit for drilling.

To prove the practicability of setting corn in rows, or to disprove the necessity of scattering it about at random, for the benefit of all the fowls of Heaven, is a task, which carries very much of the ridiculous about it; and yet seems to be necessary. As to the first, whole countries have immemorially performed it, on soils of every possible description, upon the plain, in the valley, and to the very summit of the mountain. The most enlightened men of this country have preferred, and successfully practised it, upon every kind of soil. If light lands are best adapted to the practice, so also are they to every other species of culture, but beans are both drilled and dibbled, by custom, upon the stiffest and roughest soils, which demonstrates the practicability with other corn. The quantity of land in this country, which cannot be either drilled or dibbled upon, is indeed very small, and in my opinion, the setting corn of all kinds in rows, upon the steepest ascents, where the operations of the hoe-plough are impracticable, would amply repay the extra expense of hand-hoeing.

Where now lies the pretended impracticability of setting all plants in regular rows, upon the farm, as well as in the garden? No where upon earth, but in the breach of sacred custom, and in the indolence of those who can live without breaking it But the vast expense of the practice—What of that?—since granting it doubled, or even trebled, the bounteous earth repays all. I must repeat, that in business, *it is not the expense of a measure which ought to be the question, but whether there be a certainty of spontaneous repayment;* and here generally lies the grand error of persons unhabituated to calculation. To allow this (greater cost) is merely gratuitous on my part, for I am convinced, that the drill-culture in its most expensive variety, if judiciously conducted, is far cheaper than the broad-cast; that it may cost more money at the outset is beside the question. It has been said, where shall we find skill and labourers? I answer, seek and ye shall find. No man in the country, who has *diligently* sought in this business, has been ever yet disappointed; and our population, in the despite of Dr. Price and his disciples, has been upon a progressive increase for a long series of years, and obviously so much of late, that the want of labour is likely to become a very dangerous want, and one that should be instantly supplied. As for the skill required, to bor-

row the sense of Tull, and to acknowledge the obligation (which, by the by, I wish every one would do also) surely our trouble is well repaid, in learning a beneficial art or science, whether it be corn-drilling, geometry or navigation.

The very best conducted system of random, or broad-cast husbandry, is liable to great defects, all which, as far as possible, are remedied by the row-culture. As to the worst part of the common husbandry, it has ever been, and of late especially, most highly injurious to the first interests of the country. The place occupied by weeds and fallows, and the seed wasted, would supply a very large part of our population with bread and flesh provision.

The theory of vegetation is well enough known, in the general, that is to say, well enough for the advantageous practice of husbandry. A plant, like an animal, is furnished by nature with organs for the attraction of its food, the ejection of its excrement, and the respiration of the common air. These organs are the fibres or suckers of the roots, and the filaments and vesicles of the leaves. The earth is a pasture to the animal plant, the substance or essence of which it absorbs, most probably, as has been already said, in the form of vapour or gas, the recrement of which is excreted through the leaves into the atmosphere, whence, in due time, it again returns to the earth. The matter which descends from the clouds must, I conjecture, ever be received by the roots of plants, through the pores of the earth, and not by the leaves, which only perform the function of lungs, and do not appear to me to possess recipient organs for any substance excepting air, which is necessary to them as to animals, for respiration only. I am thence inclined to slight the notion of vegetables with large and succulent leaves, drawing their chief nutriment from the air, which must be a light and windy diet to either plant or animal; and, to conclude, that their supposed quality of non-exhaustion is to be attributed to a very different agent; the hoe probably.

We see, in the case of weeds, most plainly, that pulverization, or reducing land to the finest particles possible, rapidly promotes vegetation. Seeds are locked up and may perish in hard, cloddy earth, and growing plants are starved and stunted in such; but by reducing it to fine particles, the delicate and minute vegetable fibres are enabled to shoot through it,

and extract their nutriment; and the fibres themselves, with analogy to those of the animal body in certain cases, increase with the increased quantity of food, until the plant has attained its greatest possible size. By this loosening and rendering fine the soil, another indispensable point is gained, it is made pervious to the genial heat of the sun, to the corrective rigour of the frosts, to the dews, and to all the fructifying bequests of the atmosphere. The surface of the earth being hard and impenetrable, the atmospheric manures cannot find admission, but remain to be dried up and exhaled by the heat of the sun.

We now approach the celebrated hypothesis of Tull. He contends, that earth being the sole food of plants, infinitely divisible, and possessing within itself the means of restoration, can never be exhausted, provided we are constantly giving those vegeto-animals fresh pasture, and destroying their competitors, the weeds, by *pulverizing the soil*, which operation, both on the score of penetrating to sufficient depth, and of economy in point of expense, must be performed by the *horse-hoe*.

Without giving up the sovereign use of manures, particularly the animal, I freely acknowledge I have ever been disposed, respectfully to accompany this philosophic agricultor a great length. The case is equal between the poorest and the richest soils, the produce will be proportional in both, with or without manure. What tracts of land there are of all degrees of quality, which have been tilled time out of mind, with barely manure enough to make a difference in the question, and yet have produced and supported their occupants. I have known a man who farmed near fifty years without a fallow, and with very little attention to manure, and yet his crops were generally on a level with his neighbours'; what is truly singular, he was a man of the old stamp, in all other respects, and lived in a fallowing district. These are not conclusive.—But to come closer—suppose the manure bestowed upon land is barely adequate to the support of the weeds suffered to grow upon it, you may then just as well omit the manure, and extirpate the weeds. In the old husbandry, quere, whether the quantity of manure ever exceeds, does it equal, the fair demand of useless vegetation? I am convinced that many farmers of that sort within my knowledge, would succeed, at least equally, upon the Tullian plan, rejecting manures altogether. Their lands would have less straw, no weeds

to support, and from pulverization, enjoy at least the benefit of the dew of heaven. As it is, they are doubly cropped with corn and weeds, their surface is ever rough, and the quantity of manure bestowed, scarcely worth a note. A certain young farmer of my acquaintance, once lost a favourite Chinese boar for several weeks; after searching all the country for twenty miles round, the hog was at length found asleep, in a cover of docks, thistles, and oats, upon a fallow into which the men were about to plough some manure, in order for wheat seed. This piece had grown oats the year before, and six weeks previous to the time I am now speaking of, a few small heaps of dung had been deposited, which the rays of the sun had reduced to a powder.

I will now submit the making up of my mind on this subject to better judgments. I believe the mere horse-hoeing system, without any artificial manure, far superior to the old English one in which the land was and is, in many cases, exhausted by weeds in a three-fold greater degree then benefitted by dung; with this important superiority of the hoeing plan, that supposing the arrival of both parties at stark poverty, or mere *caput mortuum* in the soil, the latter would possess the striking advantage of being sent to Bath, that is, fallowed for grass, perfectly clean, and in a proper state to receive all the restorative benefits nature has to bestow; whereas, in the old way, land is always turned to grass with its surface and its bowels full of the most devouring and exhausting trumpery, which is nourished with the crop, adulterating and poisoning it, and attracting to itself great part of the benefit of the fallow. Hence there can be no pure, or sufficiently ample grass-crops, on the old plan. I hold the present improved broad-cast system, with sufficient courses of pulse and green crops hoed, for the attainment of the *due* quantity of manure, far superiour to the naked system of Tull: but, after mature reflection, reading all I have been able to lay my hands on, upon the subject, and attending to a number of experiments, I give a decided preference to Tull's practice, aided by manure. It being left to my election, I should just as soon think of broad-casting cabbages, as wheat or oats. The admission of air and of moisture to the roots, through the loosened soil, is of the first consequence to all plants equally, culmiferous, or otherwise; and if space and hoeing will cause beans to kid to

the very bottom of the stems, it will also occasion wheat to tiller and ear in proportion. If beans require more space than wheat, it is simply on account of their greater bulk, and for the same reason that a cart-horse may need a larger stall than a saddle-horse.

OBJECTIONS, WITH REPLIES.

It is remarkable without being at all wonderful, that nearly every individual objection, made at this time, to the drill husbandry, has been previously made, and satisfactorily answered by Tull. In truth, the *wholesale* practical answer, that drilling has had for years together the most unquestionable success on all soils, and is still in a prosperous course, might well preclude the use of any detailed replies.

The same mode of rejoinder, in the behalf of Mr. Kent, may well serve for Mr. Brown, author of the survey of the West Riding of Yorkshire. Equally strong and wet, probably stronger clays than Mr. Brown ever has had the opportunity to cultivate, have been long and advantageously tilled in South Britain, without fallows.

Objection.—1. The difficulty of obtaining proper implements, and well-skilled labourers.

Reply.—Those farmers who may be inclined to make an experiment in drilling wheat* or other grain, but may neither choose the expense or trouble of using new implements, may do it to every satisfactory purpose, in the most simple way, and with the most common tools. They may make their first essay upon a single well-tilled acre, pursuing afterwards, or rejecting the practice, as they shall be warranted by success.

2. The fine tilth necessary.

Reply.—A most unlucky objection. If it be meant that some land cannot be made fine enough, the remark is groundless: no land should be sowed in a state of puddle; if properly dry for seeding broad-cast, it may be drilled, or dibbled as beans are on clays, in the spring. A certain farmer said, if he

* The Trustees of the Massachusetts Society for promoting Agriculture, will readily afford any information they may possess in regard to machines used in the drill husbandry, in foreign countries, or in Massachusetts.

took the pains to get his land sufficiently fine for drilling, he could then get a good crop independently of it; granted. But could he get as good after-crops, and as clean?

3. The danger of too *thin*, or too *rank* a crop, subjecting the corn thereby to blight and mildew, or to being beat down.

Reply.—A common risk to both methods; but if any practicable remedy, surely more so with corn in rows. All experience seems to prove drilled corn least subject to blight and mildew. As to lodging, it was perfectly reasonable to presume strong, elastic stems the least liable, and experience has confirmed that theory.

4. The plants too thin upon the ground, and land lost in the intervals.

Reply.—No. Because most drilled crops exceed the broad-cast in quantity. Is there any advantage in the spaces being occupied by weeds, which they undoubtedly would under the random-culture? Drilled crops producing more, or even equally on less space, is a sufficient answer.

5. Later at harvest. I have neither observed this of drilled crops, nor have I heard such a complaint from the drill-husbands. It may probably have arisen from too late sowing of Lent-corn.

6. Straw for fodder rank and coarse.

Reply.—Mr. Exeter consulted his oxen on this head, and received a very satisfactory answer. I think it not improbable that the straw may be more substantial and nutritious. Granting the validity of the objection, it is infinitely overbalanced.

The objections to drill-husbandry, which Mr. Young has lately brought up from Lincolnshire, amount simply to this, the farmers are there too rich to attend to so troublesome a process; for example, Mr. Harrison at Norton, after trying it upon a friable sandy loam, laid Cook's drill aside, not from any defect in the tool, but that the husbandry "wont do here;" a good old-fashioned reason, which, it is probable, his father or grandfather before him, applied also to the culture of clover. There was a time, (see Ellis, Tull, and later writers) when both clover and turnips *would not do here*. Mr. Graburn, of Barton, has been a successful driller of barley, and various other crops, yet he finds *the system so tedious* (there's the rub) that he has given it up, and now sows all broad-cast. We all remember Mr. Billing's

successful culture of carrots, and his (surely not consequent) relinquishment of that culture. Twenty-five years ago, I remember a farmer took it into his head to cultivate twenty acres of fine rich land, with a certain garden crop; he made an immense profit, yet although the London seedsman, who was the purchaser, year after year, importuned him to repeat the crop, it was all to no purpose, the farmer was inflexible, never would, nor ever did, to the day of his death. I leave it to the naturalist to account for these phenomena.

Mr. Cod, of Radby, approves the Drill for turnips, and all corn but oats, with which he could obtain no success, assigning, I think, a whimsical reason for his failure. Drilling of oats has been successful in every quarter, as far as I know, without excepting Lincolnshire. From this accidental deviation, which, on a near inspection, would no doubt, be easily accounted for, this gentleman (as has ever been the fashion amongst agriculturalists) will no doubt form an erroneous general conclusion. It is thus agricultural *principles* are fabricated, without any very near relation to nature or logic. A respectable farmer and stock-breeder in Sussex, I am told, will not hoe his broad-cast wheat, because the hoe destroys the fibres of the roots; now as those fibres are and ever have been increased both in number and strength, by the salutary operation of the hoe, *upon all sorts of soils*, it is perfectly allowable to place the objection to *the old account*. A writer (in a note M. S. of the Board) never knew drilling to answer any good purpose, but for beans; for those it was the best method. Which being interpreted will stand thus:—The *custom* of drilling beans is established. As to the comparison of drilling beans with drilling white corn, is as follows: Broad-cast either beans or wheat on a clean tilth, and one may get a good crop; drill them, and in all probability you will get a better, and in much the same proportion.

Mr. Walker has drilled all corn to a large extent; from drilling nine gallons an acre of wheat, he has had forty-four bushels per acre, over eight acres, yet has totally left off drilling except of turnips. Mr. Young has spoken sufficiently of the ample crops of thistles, and other similar blessings of husbandry, in Lincolnshire. All arguments on the subject are superfluous.

It is now necessary to exhibit some actual experiments, as specimens of the practice of drilling, and these, in preference

to any memorandums of my own, I shall select from the authorities of our most celebrated cultivators. I shall begin with Mr. Amos, author of the Theory and Practice of Drill Husbandry, and Manager for Major Cartright, at Brothertoft, Lincolnshire, who has favoured the agricultural world with a connected series of comparative experiments, of nine seasons continuance.

Mr. Amos began the experiments in 1783, upon various kinds of soil, and in every one of them, employed two acres of land, laid up in eleven feet ridges, and drilled, and sown broad-cast alternately.

1. Experiment on Oats.

Drilled acre.	*l.*	*s.*	*d.*	*Broad-cast acre.*	*l.*	*s.*	*d.*
Expense, - -	2	5	0	Expense, - -	2	8	3
Crop, 56 bushels, -	6	6	0	Crop, 50 bushels, -	5	6	3
Profit, - -	4	1	0	Profit, - -	2	18	0

Superiority of Drill crop, *l.*1 3 0

2. Beans after Barley.

Drilled acre.				*Broad-cast acre.*			
Expense, - -	2	9	6	Expense, - -	2	9	9
Crop, 36 bushels, -	6	6	0	Produce, 30 bushels,	5	5	0
Profit, - -	3	16	6	Profit, - -	2	15	3

Superiority of Drill crop, *l.*1 1 3

3. Wheat.

Drilled acre.				*Broad-cast acre.*			
Expense, - -	2	11	10	Expense, - -	2	13	3
Crop, 36 bushels, -	9	18	0	Crop, 30 bushels, -	8	5	0
Profit, - -	7	6	2	Profit, - -	5	11	9

Superiority of Drill crop, *l.*1 14 5

4. Turnips.

Drilled acre.				*Broad-cast acre.*			
Expense, - -	3	4	0	Expense, - -	3	0	3
Crop, - - -	3	15	6	Crop, - - -	3	3	0
Profit, - -	0	11	6	Profit, - -	0	2	9

Gain by Drill, *l.*0 8 9

5. Potatoes, on a light, sandy, loam.

Horse-hoed acre.	*l.*	*s.*	*d.*	*Hand-hoed acre.*	*l.*	*s.*	*d.*
Expense, - -	6	3	0	Expense, - -	7	3	6
Product, 500 bushels,	16	13	4	Crop, 420 bushels,	14	0	0
Profit, - -	10	10	4	Profit, - -	6	16	6

Superiority of Horse-hoed crop, *l.*3 13 10

A single word, by way of commentary on the above experiments, would be unnecessary. When two and two, by the obvious rule of addition, are made into four, men neither make objections, nor call for an explanation. It will be much more to the purpose, to make public demonstration of our gratitude to this sedulous and respectable cultivator, and to profit by his rules. In various other trials upon inferior land, worth about twelve or fourteen shillings per acre, Mr. Amos declares he never found the profits less than twelve or fourteen shillings per acre per annum, in favour of the practice of drilling. Mr. Amos' drill-machine is an improvement of one recommended in Duhamel's Husbandry, constructed with spherical cups. It sows 8 rows at 8—7 at 9—6 at 10—5 at 12—4 at 16 and 18—3 at 20—24 and 28—and 2 from 28 to 56 inches between the rows; and with one man, a boy, and a horse, can drill an acre of land in one hour. Expense of workmanship and materials for this machine, six guineas. It plants all kinds of grain, pulse and seeds, turnip, carrot, rape, &c. also acorns, haws, hollyberries, or the like, on any kind of land, in any given quantity, and at any depth and distance required.

The following extracts are from the prize essay of Mr. John Exter, of Pilton, Devon, for which he was lately rewarded by the Bath Society, with a piece of plate, value ten guineas. Mr. Exter is a cultivator of character and eminence in the West, a correspondent of the Society, and of the Board of Agriculture; and in the habit of instructing pupils in the theory and practice of husbandry. Mr. Exter's experiments, during six years, made with a critical and impartial attention, upon an extensive scale in every soil and situation, have uniformly and decidedly proved the superiority of the drill-culture.

He began in 1790, by drilling barley, at six inches, with Winter's machine, on a small part of a field, the inter-

vals of which were hand-hoed. The success of this, under other disadvantages, besides poverty of soil, convinced him of the advantages of the system under better management, and excited him to make farther comparisons between the drill and broad-cast methods.

In November, 1791, Mr. Exter received, by sea, from London, Cooke's Drilling Machine, which he prefers. This, I believe, is on the same principle and construction with that of Mr. Amos, already mentioned. The implement arrived somewhat too late for the seed-season; but Mr. Exter drilled with it, on a piece of too acres and a half, one bushel per acre, red Lammas wheat, in rows with nine inch intervals. The land was light, dry, loamy, barley soil, worth twelve shillings per acre, but in the state of a very foul and poor pea-stubble. A servant-man, thoroughly orthodox in the old system, and extremely averse to the supposed complexity, and loss of land by the intervals in drilling, was directed to fix on any part of the field which he considered as best in tilth and condition, to sow broad-cast, and manage as he should think proper. He confessed, the part he chose was better than the average of the drilled land, by five or six shillings per acre, and sowed his part, at the rate of two bushels per acre; and, during the growth, paid unusual attention to keep it clean from weeds. The drilled crop being thin sown, made but a poor appearance until June: the broad-cast, on the contrary, looked much more verdant and thriving, during winter, and the beginning of spring, till the end of May, at which time, it became rather sickly and yellow. The drilled crop was scarified once in March, and horse-hoed in the last week of May; after this operation, it improved greatly, and began to shew a decided superiority over the broad-cast, which evidently continued to decline. At harvest, the drilled part yielded nineteen bushels, three pecks, nine gallon measure, per acre; the broad-cast yielded not quite five bushels per acre.

In March, 1792, drilled one bushel white Lammas wheat, on one acre potatoe-fallow, worth a pound rent, prepared by once ploughing and harrowing. The plants when double-leaved, had one scarifying; and immediately after were harrowed across with the common harrow, and were horse-hoed when six or eight inches high. The crop very thin till after Midsummer,

yet a great product both of grain and straw at harvest. The acre yielded twenty-nine bushels, three pecks of wheat, nine gallon measure. This successful experiment on *spring wheat* is most important, and deserves the utmost consideration in the present state of the country.

The same spring tilled thirty acres of land, worth from 35 to 40s. per acre, with barley; fifteen acres were drilled at two bushels per acre, with rows at nine inches; and fifteen acres broad-cast from three to four bushels per acre; the preparation of the land, manuring, &c. in every respect alike. The season very wet, both during the growth of the crop, and at harvest. The broad-cast was lodged, stained, and with great difficulty harvested at all. The drilled stood better, was scarcely at all lodged, and being free from grass and weeds was all saved, without the least injury, at half the expense of the broad-cast; the produce of grain from ten to fifteen bushels per acre more, and a shilling per bushel better; and this, notwithstanding the whole of the broad-cast crop had been first sown, a remarkable advantage that year.

In the following October, Mr. Exter tilled and manured a field of ten acres, for wheat, drilling at nine-inch intervals one half the land, with half the quantity of seed with which the other was broad-cast; but, as some doubts were advanced respecting the value of the land, in different parts of the field, two twelve furrow ridges, by way of proof, were gathered through the middle of the part intended to be drilled, and the drilling was begun on each side of those ridges. The ridges were ploughed, sowed and manured, according to the common husbandry of the country, by the person before-mentioned, and every attention paid to weeding them in the spring; the drill-crop was scarified and horse-hoed once. At harvest the two ridges were cut first, and immediately after a breadth of the broad-cast on each side of the ridges was cut, and each part stacked and kept separate, until it was dry enough to thrash, when it was carted into two different barns, and immediately thrashed and winnowed; when the drilled crop yielded 29 bushels 3 pecks, the broad-cast 20 bushels 1 peck. In order to guard against any suspicion of fraud, the whole was winnowed and measured by the same man, the person who was so very averse to the drill system.

From these successful experiments, Mr. Exter has been induced to drill the whole of his white-corn crops ever since, excepting only a part, sown in the random method, by way of proof; and, in all his trials, has experienced an invariable superiority in the drill-culture, without even a single instance of equality of product in the broad-cast method. All the pulse-crops he leaves out of the question, since, with regard to the superiour fitness of the row-culture for them, there seems to be but one opinion; but he avers, confidently, the same thing, respecting turnips, in which opinion I have the fullest conviction he is right. To drill turnips, is to put in for a fair chance of doubling the worth of the crop. Having reconsidered the matter, and, from some late observations, I would also advise the drill and horse-hoeing culture for carrots, more particularly if manure be scarce.

This worthy disciple of the Tullian School, exhibits an account of several farther experiments on barley, oats, and turnips, drilled at twelve inches apart, in which the result was similar to the above stated, with the mention of a fine crop of beans drilled in two rows, at nine inches, with an interval of twenty-seven, which became quite a thicket. It happened, from this luxuriance of growth, that part of the rows could not be hoe-ploughed a second time, which fortunately served to demonstrate the immense difference that omission made, in the friability of the fallow, and the vast importance of the horse-hoe; the part twice-hoed, worked afterwards better on a single ploughing and harrowing, than the other part would with three times the tillage. The one appeared a fine mellow loam, the other a clay. Mr. Exter also records Mr. Secretary Young's frank acknowledgment of the superiority of the drill-culture; a circumstance which will, as it reasonably ought, have great weight with the majority of our cultivators.

The following facts and opinions respecting the mode of culture in question, are also extracted from the papers of the Bath Society, being the substance of a letter from the Rev. H. J. Close, of Hordle, near Lyminton, Hants, a worthy and estimable character, as his various agricultural correspondence, for many years past, fully evinces; and a real practical cultivator upon a considerable scale. I have a sincere pleasure in this opportunity of paying my share of that tribute of applause, due

from his country, to this patriotic votary of the plough, whom I had formerly the honour to know personally, but whom I have not had the pleasure to see for near thirty years.

Mr. Close formerly asserted, that he saved full 200*l.* per year in seed, by drilling his corn upon 500 acres of land, although by no means so perfect in drilling and horse-hoeing as he has since been. In proof of this he gives the following quantities, which he actually has, and still continues to drill, on 131 acres, with a comparative statement of the quantity broad-cast in the common husbandry.

Expense of seed-corn upon 131 acres of land, sown in the usual broad-cast husbandry.

	bush. per acre.		*per bush.*	*l.*	*s.*	*d.*
31 Acres Wheat,	3	at	7s.	32	11	0
20 – Early Peas,	4		8s.	41	12	0
18 – Dun Peas,	4		5s. 3d.	18	18	0
15 – Tick Beans,	3		5s.	11	5	0
6 – Early Maz. Beans,	3		6s.	5	8	0
12 – Oats,	4		3s.	7	4	0
13 – Barley,	3		3s. 6d.	6	16	6
12 – Vetches,	3		6s.	10	16	0
			Total,	134	10	6

Expense of seed-corn upon 131 acres of land, in the present improved drill-husbandry.

	pecks.	*per bush.*	*l.*	*s.*	*d.*
31 Acres Wheat, per acre,	3	8s.	8	2	9
26 Early Peas,	3	8s.	7	16	0
18 Dun Peas,	1	5s. 3d.	4	14	6
15 Tick Beans,	3	5s.	2	16	3
6 Mazagan Beans,	3	6s.	1	7	0
13 Oats,	1 bushel,	3s.	1	16	0
13 Barley,	1	3s. 6d.	2	5	6
12 Vetches,	1½	6s.	5	8	0
		Total,	34	6	0

Seed, broad-cast,	134	10	6
—— drilled,	34	6	0
Saving in seed upon 131 acres, by drilling,	100	4	6

It is the opinion of Mr. Close, that a clear saving of *five millions* sterling a year might be made, in the article of seed-

corn, and double that sum, in the produce, and application of that produce, by the improved system of husbandry, as at this moment practised by some few spirited farmers, that, (without pretending to minute accuracy of calculation) 8,000,000 bushels of wheat, 3,000,000 bushels of barley, 1,000,000 bushels of rye, 4,000,000 bushels of oats, and 1,000,000 bushels of peas and beans, which are yearly thrown away, in superfluous seed, might be saved, independently of the additional produce, which, by the new system, might be obtained. Thus it is possible to add fifteen millions annually to the national wealth! That more than double the present scanty portion of tillage, now given to the lands of England, would amply repay the farmers for their extra labour and expense; that four times the stock might be wintered, and the aggregate produce doubled. On the latter part, at least, of these statements, I agree with Mr. Close, without the smallest hesitation—they are capable of the most palpable and satisfactory proofs.

Mr. Close acknowledges his obligations to the agricultural as well as mechanical skill of the ingenious Mr. Cooke, by whose implements, namely the *Scarificator*, *Cultivator* and *Quitch-Rake*, he was enabled to pulverize his strongest land to the fineness of dust, and to cleanse it from weeds, at a little more than a quarter part of the expense necessary to make an equally good fallow, with the common implements of husbandry.

The following account of two crops of drilled turnips, is interesting in the highest degree. "Two adjoining fields were taken at Lady-day, from a little farmer, in a very foul and impoverished state; and well pulverized and cleaned, by frequent scarifying, rolling and harrowing. The quitch-grass was drawn out by the quitch-rake, and burned on the land. After these operations, which cleansed, levelled and pulverized the land about six inches and a half deep, one field of four acres was thrown on two ridges by one bout of the plough, three feet from the centre of one ridge to the centre of the other. A triangular sled of wood, drawn by one horse, and held by a boy, was passed at the bottom of each furrow, to make them about two feet wide, which operation was necessary, merely to widen the bottoms of the furrows, that the rows of plants might be exactly over the manure. In these furrows, some long wet straw from the farmyard, half rotted, was laid, about ten common carts per

acre; the ridges were then split and reversed, throwing all the pulverized soil on to the dung; one horse and a boy, with a long bar of wood with handles, beat down the tops of two ridges at once, leaving a surface about eighteen inches wide, and prepared the land for drilling. The horses then walked in one furrow, each wheel occupied another, and four rows of turnips were drilled on the tops of two ridges, 11½ inches from row to row on each ridge, and 22½ inches interval.

"As soon as the turnips were in rough leaf, the corn scarificators were passed through them, a furrow was taken from each side of the ridge, with the common Suffolk plough, and the turnips in the rows, were hand-hoed. These operations were performed twice, and the whole land thrown up to the turnips by the common plough, which finished. The field was sowed in the first and second weeks of July. Before Michaelmas, no appearance of intervals could be seen, and the field exhibited the finest and most regular crop of turnips ever beheld; many of them weighed 25lbs. each, and measured three feet three inches in circumference. Agriculturalists and farmers from many parts of the country, visited the farm, and were astonished at the regularity of the crop, and the size of the plants. The average weight of each turnip about 12 or 14lbs. The acreable weight was ascertained by weighing a few rods, to amount to 55 tons. The turnips were most of them drawn, their tops and tails cut off, and stacked before the frosts, and are now, *this fifth day of March*, perfectly sound and good. Never, indeed, did bullocks fat faster than on these turnips: *They were lean, working beasts, put up the beginning of November, and will soon be very fat, as they already weigh about 45 score each, and it is supposed they will reach 50 score each, by the middle of April.*

"The other four acres were treated exactly like these, except being sown without any dung, and ten days later than the first field; yet, to shew what extra tillage, and throwing the whole of the soil to the plants will effect, these were a very even and beautiful crop of turnips, allowed to be the best in the country, excepting the adjoining field, and a neighbouring one, tilled in the same method. The advantage of this system must be apparent; the young plants, when the land is mucked, are absolutely on a hot-bed, and grow so rapidly, that they are in little or no danger from the depredations of the fly. The

intervals admit sun and air, without loss of land, as the whole of the pulverized soil is thrown to the part of the land occupied by the plants. The land is better tilled by the use of the horse-hoe, and common plough, than it can possibly be by hand-hoeing; and the expense of hand-hoeing is reduced one half, by having merely to hoe the rows of turnips, and to single the plants. Thus a more complete fallow is made, and a much heavier crop obtained, at about one quarter the expense of ploughing four times, dragging, &c. as in the common system: but great success must not be expected, without first obtaining the most complete pulverization."

THE HALF-HUSBANDRY. The following experiments were upon a larger scale, but the accounts were reduced to an acreable one, for the convenience of the reader. "One field was fallowed for two years, an ddressed very highly: September, 1795, thrown on two ridges, 4 feet eight inches wide, exclusive of the furrow. October 1st, every other ridge was drilled with red wheat, a little more than 3 pecks per acre, 11½ inches from row to row. It was twice horse-hoed in the spring, and the 4 feet 8 fallow ridge was ploughed up to the wheat, and back again, and then one furrow was thrown up to each outside ridge, on which the wheat had been drilled. The wheat was so very luxuriant, that it was laid in the grass, and I was obliged to feed sheep with it, until the middle of April. One row of potatoes was then planted on the centre of the fallow ridge; these were ploughed between, and well hoed. The produce of the two acres of land was wheat, seven quarters, three bushels per acre; potatoes, per acre, one row on each fallow ridge, fifty sacks.

"The following year, the potatoes were grown on the ridge occupied by the wheat the preceding year; and the wheat upon the fallow ridge, where the one row of potatoes grew. Both crops looked equally strong and good the second year; but the result was not ascertained. But there can be no doubt, that by thus alternately cropping and fallowing, the land would improve every year. A similar experiment was made in an adjoining field, trusting entirely to pulverization, without manure. From this field, two successive good crops of potatoes were taken, without any dressing. The potatoes were planted with three feet intervals, and ploughed between; the land was in very high

tilth, drilled at the same time, and in the same method, as the other field. In the spring, the wheat looked thin, but of a good colour. It was twice horse-hoed, &c. At harvest, to Mr. C.'s surprise, this produced seven quarters, one bushel, per acre; only two bushels less than the field which had been manured at 5*l.* per acre expense. Forty sacks only, of potatoes, were produced from the one row, on each fallow-ridge in this field. The same year, in an adjoining field, there was a fine crop of broad-cast wheat, to appearance, after beans, well dunged; and the farmer assured me he had only three quarters and a half per acre. Indeed the ears of the broad-cast corn were very small, and about three or four inches long. In the drilled red wheat, were many ears eight inches long, measured by numbers of gentlemen who went to see the crop."

So convinced is this true patriot of the soil, of the superiority of the new, over the old, or random method of husbandry, and of the great public utility of having this superiority clearly ascertained, to the conviction of all farmers, that he has challenged all England to cultivate 24 acres of land in a six years course of crops, row against broad-cast, for *a thousand pounds*, the drill annually to exceed the broad-cast crops, one guinea per acre. Mr. Close, at the same time, most generously declaring his intention of bestowing the money, should he prove a winner, in charitable purposes: thus in fact he is, from pure motives of public good, nobly risking his own property against nothing. Bath papers, vol. 9. p. 44.

A. Collett, Esq. of the county of Suffolk, a cultivator of great skill and experience, as his observations in the report from that county fully evince, thus speaks of Cooke's drill, and of drilling in general. "It has nine coulters, goes with two horses, and will keep pace with the plough; in barley-sowing it finishes ten acres every day, with ease to the horses, and can never be affected by rain or wind, and will deposite the corn the same, whether the land is hilly or level. A one-horse roll should follow the drill, to close the land upon the seed, and then the more the land is harrowed the better. Farming should come as near to gardening as possible; but nothing will accomplish it like drilling. Let any judicious agriculturist examine the rows of peas or kidney beans, in a garden, and see which are most productive, the thick or the thin ones. Let him examine

the young plants of clover in drilled barley, and in barley that is sowed broad-cast, it will soon be distinguished which has the preference. Dibbling and drilling corn have been attended with the best consequences to the poor, by encouraging the farmer to weed it in a ten-fold degree, to what he did when sown broad-cast; and, as the ploughing, rolling and harrowing, are more attended to by the farmer, the land is in a better state of tillage than ever was thought necessary before they were introduced."

In Mr. Collett's opinion, very little seed is saved by drilling; but the Rev. Mr. Hill, of Buxhall, same county, an experienced cultivator also, finds that he saves at least one half his seed, by drilling it; and I have been often enough convinced that he is right. This gentleman has found, by repeated experiments, a superiour produce of wheat, planted eighteen inches asunder, than at a nearer and more fashionable distance: in this particular, also, thorough tillage pre-supposed, I fully concur with him. In one crop, his eighteen-inch rowed wheat, produced more straw, (a thing uncommon,) than that at nine inches. The former produced 8 coombs, 1 bushel, 1 peck of wheat; the latter, 7 coombs, 1 bushel, 2 pecks.

In the section on implements, I have just mentioned those of the celebrated Mr. Ducket, of Esher; it may not be improper, in this place, to give a slight sketch of his drilling-system, as practised a few years since. He drills white corn at nine, tares, peas and turnips at eleven, and beans at eighteen inches asunder.

Mr. Ducket has, for a great many years, drilled all his crops. He was at first contented with hand-hoeing, until he discovered the vast superiority of the horse-hoe, to which he has ever since adhered. He has been accustomed to drill in both methods, that of East Kent, by striking out the furrows, but with a new implement of his own, having five shares, and then broad-casting the seed into the furrows; and also by delivering the seed from a drilling machine of his own invention. To the latter, I believe he has of late years given the preference; and he executes it as follows: his land being in fine tilth, and usually thrown into ridges, he draws five channels with the implement just mentioned, having as many shares and broad-boards; his dropping-machine follows, shedding the seed into five channels, which are closed by a harrow. The crop being high enough,

he horse-hoes it with two hoes, each guided by a man, and these, at once, hoe five rows each. They work one on each side the furrow, which divides the beds or ridges; of course, hoeing at once five rows on each bed, or two half-beds. The horse is led in the furrow by a boy, and by the help of a long whipple-tree, draws both the horse-hoes, which completely hoes the ten rows. When the work is strong, two horses are used, but no injury is ever done to the beds, the horses always going in the furrow. He has also six shared tools, which, in course, hoe twelve rows at once.

Mr. Ducket preferring narrow furrows, his ploughs are constructed to turn them only nine inches wide; although so much work may not be done in a day with these as with larger tools, the soil is much better broken and divided. His trenching or skimming plough, is a most effective implement. It is double-shared, the one directly over the other, for the purpose of trenching, or taking one narrow, shallow furrow off the surface, and another beneath it, to any moderate depth desired; it will work from five to ten inches deep. The use of this implement, in putting in one crop on the back of another, in burying green manure, or long dung, out of the way of being a hindrance to tillage, is equal to every idea of excellence: it has turned in green rye, six feet in height, upon which a crop of turnips was immediately after obtained. Not an atom of the crop turned in remains sticking out of the furrow-seams; the whole is completely buried, and the surface left perfectly free and clean for the reception of seed.

This cultivator did not formerly aim at any great saving of seed, by his practice of drilling, since he used nearly as much, as many others do in the broad-cast method, even to the extent of two bushels and a half of wheat, three of barley, four of oats, three of beans, and two pounds of turnip-seed. He abides by no particular course or rotation of crops, but sows that which he judges, either from the fitness of the soil, or the state of the market, will answer best. He has cultivated spring-wheat with success, and even several years successively on the same land, which practice he recommends, whilst the price of wheat is high. In this intention he prefers the Siberian wheat, as of quicker growth, and not so great an exhauster as the common, and which nourishes grass-seeds, equally well with other spring-

corn. He has reaped this wheat the 25th July, sown turnips on the stubble, fed those off by Christmas, and resowed the ground immediately with Siberian wheat; this course he has pursued three years successively. Wheat harvest being likely to prove late, he broad-casts turnip-seed upon the cultivated rows of corn, with a prospect of rain which buries the seed; but I should conceive it had better be rolled in by a short roll drawn by hand. One of the fundamental principles of his tillage is, the practice of alternate deep, and shallow ploughing. One deep ploughing with the trench-plough is given to every other or every third crop, with very shallow intermediate stirrings, by the two-share plough. From deep ploughing, fresh virgin earth is brought up for the nourishment of the plants, by not repeating it too often, the moisture is retained in the soil, being neither too loose to overdrain, nor yet too hard for the roots of the plants to penetrate.

The above particulars have been lately confirmed to me by an acquaintance of the Ducket family, from whom I farther understand, those eminent cultivators have abandoned the practice of broad-casting their seed, from a conviction, no doubt, that smaller quantities are equally productive, and that a great saving of seed, is really among the advantages of the genuine drill-husbandry.

But a truce with arguments to prove *the advantage to vegetation of a pulverized soil, the profit of growing corn, in place of weeds, or the probability that plants will prosper equally well, nursed and trained up, in regular rows, as if the seed were cast at random, and committed to the nursery of blind chance.* Some useful hints tending to forward the attainment of those advantages already proved, will be now more in place. The immense advantage of pulverization, as has been remarked, is fully proved by the sudden crop of weeds, sure to succeed the operation of fining land; and, to the finer powder it is reduced, by so much the more abundant will be the crop; and, that so many seeds fail upon sown land, is to be attributed to its clodded and rough state, whence they are actually starved, from inability in their tender fibres, to perform the act of absorption, on such a rugged surface. Were it possible for any farmer to dispute this fact, or to call for proof, amongst a hundred other instances, I could quote that of a certain field, which, previous-

ly to being pulverized for a crop of carrots, was the cleanest upon the farm; but, from the tillage afterwards given it, became such an entire bed of weeds, as to attract the notice of all who passed; yet, its subsequent cleanness was equally remarkable. Generally speaking, it is the powdered part of the soil, from which plants draw the chief of their nourishment, the entire, or unbroken, remains either perfectly useless, or affords them only a scanty and precarious subsistence. Land thoroughly powdered and tilled, during vegetation, will freely give up the whole of its genial virtue to the crop, and under incessant tillage, without a proportionate quantity of manure in return, will, after a certain period, when the food of vegetables shall have been completely exhausted, become totally barren and effete. Tull, it is true, has denied the possibility of exhausting land by tillage, and surely upon better grounds than we assert it; since it must be acknowledged ours are assertions only, his, proofs by long-continued experiments. Without any question, we know how to exhaust land most perfectly; but who among us has effected this purpose, with constant and accurate tillage? Tull so far proved the truth of his system, as to grow wheat and other corn many years in succession, trusting entirely to a constant powdering of the soil, and to freeing it from the exhaustion of weeds, without the aid of a single bushel of manure of any kind; and his crops were yet better than those of his neighbours, and his land, too far removed from fruitfulness by nature, still improved under his hands. I have now no need of Tull's arguments to convince me, that no kind of land, whether the best or the worst, can ever be exhausted; on the contrary, the most barren will be improved by cultivation, the tillage being perfect, and manure being in proportion to the quantum of food drawn by the crops.

Two grand objections to the drill-husbandry are, the intractability of clays and sands, the too great natural looseness and want of tenacity; the one species cannot be wrought sufficiently fine, the other is, conjecturally, apt to be rendered still lighter and more spongy by much stirring. Probably, as to light lands, the plea is merely notional and unfounded; partial and insufficient stirring may, indeed, render them still more hollow and spongy; but effectual and repeated work will consolidate, and make them lie still more close, an end obviously to be at-

tained by comminution or reduction to small particles. Poor land, also, by being often stirred, acquires the more frequent supplies of elementary manure.

The difficulty of working clays and strong rough lands fine, for the row-culture, (bean-crops, however, form a good exception) has been the grand bar to its progress upon such, and yet upon clay-lands, of all others, it would be most signally advantageous, because of the benefit they would receive from the operations of the hoe-plough, in the attainment of the great object, friability, by which they are rendered the most powerfully productive of all soils. This kind of land must, at any rate, be tilled at the greatest expense; at least, although such is no where half tilled in any part of this island, within my knowledge, great strength is always kept upon a clay-farm, on that pretence. A part of this strength, generally misapplied or ineffectually employed, in a perpetual turning up of immense and solid clods by the plough, would pay excellently well by being applied to the cultivator and horse-hoe. This stubborn earth, from constant pulverization, would in time submit, become friable, and almost change its nature to a dark, crumbly and fruitful loam, a favourable metamorphosis, in consequence of stirring, which I have repeatedly witnessed with pleasure. It is known, although not so generally as its importance demands, that the most sour, harsh and infertile subsoil, of whatever colour or quality, by dint of exposure to the atmosphere, and by the aid of frequent stirring, will become good and fruitful land; what then may not be expected, by continually working a good strong clay, draining it, and at the same time, rendering it pervious to the enriching dews, which will otherwise remain to be exhaled, upon its hardened surface? The operations of the horse-hoe, immediately previous to the frosts of the winter-season, will have an effect equally beneficial; for, indeed nothing, whether natural or artificial, confers so great a benefit upon a clayey soil, as severe frost; manure comes in no competition with it, at least for present assistance; whence I have been always inclined to slight the advice of those who direct us to keep poachy land whole, or in ley all winter, for the sake of an earlier passage upon it in the spring; a very poor perhaps totally worthless recompence, for so capital an advantage as is given up; for, if the lands are well and skilfully fallowed up, before winter, it is probable you

may approach equally early in the spring, and even if otherwise, that you will lose no ground by waiting a reasonable time. I once manured very highly, in the autumn, a piece of strong, deep, baking clay, intending to sow it. Much rain falling, the land changed into such a puddled, soapy state, its ill condition also doubly increased by the dung intermixed, there was no possibility of getting in the seed, with any good prospect. The land was therefore left as it chanced to be, in ridge and furrow, by which it was well drained, until the spring, and a hard frost intervening, it broke up in perfect powder, of a darker hue than usual; and with the dung (which had been laid on green) well rotted and mixed. In fact, it appeared the real *putre solum*, or rotten and mouldy soil, so highly celebrated, and fitted for the instant reception of the smallest seeds. It must be observed too, that, on trial, this beneficial effect reached no farther than the plough had penetrated, which proves the advantage of deep ploughing in autumn. A part of the same land, which had been left whole throughout the winter, turned up in the spring, in immense and stubborn clods.

The unsuccessful attempts at drilling, have chiefly arisen, either from an improper beginning, with a soil full of couch and root-weeds, under the vain expectation of eradicating them with the hoe, or from an almost total neglect of the hoe, after the first essays, and when the novelty of the work had become extinct. I pass over, in silence, the exertions of those redoubtable agriculturists, who have waxed weary of the labour of success. Land, intended for row-planting, should be, at first start, thoroughly cleaned from roots and grass, as well as in a finely pulverized state; the hoe will ever afterwards preserve this desirable condition.

To speak of strong soils, for in good truth, light ones present no difficulties at the outset, for drilling; I would not at all hesitate, upon such, to use the Devonshire clodding-beetle, if I found the land rougher, after the usual operations, than I approved. It stands for nothing to talk of the dearness of hand-labour, provided it pays, which it surely would, supposing it effective in this case. It would be only needed in the beginning. I have been told by a west-countryman, who worked for me, that there a man will break the clods over about an acre and a half, or more, in a day. The drill, or wedge-roller

of Norfolk, has also been mentioned as excellent in this intent. Tull, also, recommends a stone cylinder, three feet long, two and a half in diameter, and of eleven hundred weight, drawn by a simple pair of limbers, held together by two bars, firmly penned in at their ends, instead of the common frame, which is expensive. This is, doubtless, an effective implement for crushing clods, but ought not to be used but in dry weather. The land being sufficiently worked, should be gathered into ridges or beds, of a width proportionate to the condition of the soil for moisture, and to the number of rows intended to be set upon them. Ridge-work seems generally advantageous; it preserves wet land from being flowed, and in shallow land, affords a bed of greater depth, and of course a more ample pasture to the plants.

Can any reasonable complaint be laid against the trouble, the expense, or the risk of such an improvement?—Can experience of value be purchased at a cheaper rate? Most farmers have been accustomed to set their beans in rows, which practice may be exactly followed with other corn; or shallow drill-furrows, equally distant, may be drawn by a common light plough, space being left between them for the hoe-plough, at any width which may be deemed sufficient, not exceeding eighteen inches. The seed, one bushel of which is a fair medium quantity for an experimental acre, may be cast into the drills by a steady hand, and covered (should that care be judged necessary) in the garden-style, by the hoe, the lands afterwards lightly rolled, and finished with the harrows. With respect to quantity of seed, in general, it may, perhaps, be safely laid down as a rule, that seed must be increased in proportion to the poverty of the land, from which cause so many kernels always perish for want of nourishment; whereas, in a rich seed-bed, nearly every individual seed vegetates. These rows, whether of twelve or eighteen inches width, may be hoed with the same plough which drew the drills, and the corn kept, by hand-weeding, in the finest garden style. Should the farmer desire to pursue the method of culture in a more expeditious way, and over a greater breadth of land, the artificers already quoted, will furnish him with all the necessary implements, particularly with drilling-machines, from five to eleven guineas each, and with ample instructions for their management.

A comparative use of the hand and horse-hoe has invariably turned out in favour of the latter, from its superiour power of loosening the soil to a greater depth, and thereby sending a greater quantity of moisture, and of atmospheric manure, to the roots of plants. Hence the vast importance of the operation of horse-hoeing, during continued drowth, in the spring or summer: and to this cause, in great part, at least, it may probably be owing, that lucern, usually rowed and horse-hoed, is said to endure drought so much better than natural grasses, and to appear green and flourishing, whilst these are withered and burned up. The almost instantaneous benefit conferred by this operation, upon cabbages which are root-bound, from a baked soil; or upon wheat which appears yellow and sickly in the spring, are its best recommendation. I have seen these crops, after being worked in the rows, from a withered, sickly hue, and flagging condition, turn erect, and change their colour to a deep and flourishing green, within twenty-four hours. Nay, of such importance is the operation of deep and effectual hoeing held, by experienced people, that I have known a Kentish farmer, in a time of great drought, send his men, with their spades, into the alleys of pease, being afraid of damage from horse-work. He inclined very much to Tull's opinion, that "English hand-hoes were fit for little else but to scrape chimneys." I had, myself, an idea of them not very dissimilar, long before I had read Tull: they are yet admirable implements, where the more powerful, among which is the spade, are not within command.

If the hand and breast-hoe could be sufficiently efficacious upon any, they must be the lightest soils, but even on such, from the idea of economy both of time and expense, horse labour would be entitled to a preference. The experiment, so often decided in favour of horse-hoeing, may be easily repeated between narrow rows, and a larger allowance of seed, and economy of seed, with alleys of sufficient extent to admit the full advantage of the hoe-plough; also, between the expeditious method of hoeing, at once, a number of rows, and the more forcible application of the simple hoe-plough, making but one furrow.

The old method of very wide intervals for the horse-hoe, whilst the seven-inch rows upon the ridges, were trusted en-

tirely to the operation of the hand-hoe, seems now to be exploded, and to have given way to the improvement of horse-hoeing the rows, a considerable number at one time. From the best inquiries in my power to make, Mr. Ducket was the first who used this expeditious process. There can be no doubt of the superiority of the practice over hand-labour; but, practised upon strong and rough soils, I am inclined to question both its efficacy and correctness, and to prefer the superiour steadiness and force of the single operation of the hoe-plough. I ought, however, to observe, that on stating this objection to the Rev. Mr. Cooke, he assigned reasons for holding a different opinion, which he supported, by quoting the practice of several cultivators of strong soils, particularly Mr. Boote, of Atherstone, near Stratford-upon-Avon; Mr. Jones, of Chailey, near Lewes, Sussex; and Mr. Thorn, of Ealing, Middlesex. With all possible deference, however, to superiour experience, I remain still unconvinced. There is nothing of greater consequence upon clays, than deep and effective tillage; and upon such soils it is, that the farmer is so commonly injured by the dishonest indolence of ploughmen, whose constant aim is, as light a surface skimming as possible, in defence of which they have a fund of the most plausible reasons; and really it is wonderful how sophistry oftentimes abounds, in proportion to the want of real knowledge. I have observed, very frequently, upon strong lands, a fine and apparently mellow and well-pulverized surface; but, taking the spade, to be convinced, this fine tilth has proved to be only half-spit deep, all beneath, turning up in clods, which would submit to no tool of inferiour force to the mattock. Now the part of such a soil left untilled, is nearly useless for the purpose of vegetation, and if labour will at all repay its expense, the more effective it is, the more certain, and in the greater proportion, will be the repayment. For reasons like these, I have doubted the advantages of scuffling in seed; unless, indeed, upon soils which have had the previous advantage of deep and thorough pulverization from the hoe-culture: and such reasons operate in my mind, equally in favour of the superiority of the single hoe-plough, and sufficiently capacious rows. A machine will drill four or five rows at once, at the requisite distance.

Respecting the depths in the ground, at which corn ought to be planted, the matter must vary in different soils and circumstances, and the depths must be greatest in sands and dry seasons. Wheat and rye will require to be placed near three inches deep in some soils, in others barely two; oats and barley, two inches; beans and peas, three inches; and all small seeds from half an inch to an inch.

The number of hoeings required by this culture may, perhaps, be generally stated at four, although five may be required, by extraordinary circumstances. The chief rule in course, is the presence of weeds, which are never to be permitted, whatever may be the number of hoeings required.

The first hoeing of wheat, (of such, I mean, as has been sowed sufficiently early to admit that operation in autumn,) must never be performed until the plant shall have more than one blade; and it may be deferred until it hath four or five leaves, provided no urgency appear, and that the operation be completed before the setting in of winter. Tull directs to hoe from the rows, up and down, the first time, which leaves a ridge in the midst, and a furrow or channel on each side, between that ridge of the plants, to catch the rains and snows of winter; and doubtless, by that method, the greatest possible superficies of the soil are exposed to the influence of the atmosphere. He asserts, on experience, that you can scarcely plough too deep the first time, nor approach too near the rows, provided you do not cut the plants, or absolutely root them up; and that by thus laying the roots almost bare, and exposing them to the severity of the frosts, you do them no manner of injury, a practice, about the rationality of which I am at present uncertain, having always entertained the idea, however erroneous, that the roots of all plants were comforted and strengthened, during the rigours of winter, by being earthed-up; and I believe Miller held the same opinion. Tull, however, acknowledges that in very light lands a greater caution is necessary, in approaching the rows. He remarks it as a common errour of servants, in the use of the hoe-plough, that they merely skim up and down the midst of the alley, neither going sufficiently near the rows, nor sufficiently deep; and recommends, as an amendment of this errour, to trench, or draw a second furrow to a proper depth, immediately, if practicable; otherwise, before

the ridge be turned back in the spring. The plants will thus stand, as it were, on the brink of a trench, by which they will be drained, and kept constantly dry; they will also be sheltered by the ridge which has been thrown up. It will occur to those who drill upon strong soils, that there is danger in deferring too late their first horse-hoeing, lest the land become too wet to work.

The spring-hoeing may be given, as soon as the frosts are out of the ground, and the surface is sufficiently firm and dry to carry the cattle: the ridges between the rows are then to be split, and the mould finely pulverized and manured by the frosts and snows, thrown to the roots of the plants, the fibres of which expanding to the general warmth of the season, are now ready to attract every particle of nourishment within their reach. Nor is there the smallest damage done to roots, by the breaking or disturbing with the hoe those numerous filaments or threads, which branch out on every side, since nature (as may be observed in all vegetables) in a very few hours not only remedies the defect, but ever provides mouths or suckers, in proportion to the nourishment offered; nor is it possible, the nourishment being simple earth, or manure not too gross to overfeed or glut a plant; which, nevertheless, may be effected, according to my observation, by excessive and superfluous quantities or rank dung, poisonous to the vegetable juices, whence atrophy or consumption will ensue, and the plant become stunted or even wither away. The cultivator will judge of the necessity of lightly harrowing and rolling, previously to the spring-hoeing the rows.

The succeeding hoeings, the number and periods of which must of course be at the farmer's discretion, have two objects; to turn in the weeds the instant they are ready, and to move the surface, before it become baked, and impervious to the dews; this last object must be watched with the utmost attention in a thirsty season, as the weight of the crop absolutely depends upon it; and here the superiority of the row-system will clearly manifest itself. There may subsist a farther reason for an additional stirring, in exhausted and impoverished soils, the plants on which, having extracted all the food of their last pasture, may require an earthing-up, of fresh moulds, at the critical time of their coming to perfection. Shallow ploughing can never do

any injury, at whatever season; but deep ploughing must never be admitted, near the rows, in spring or summer. The middle of wide alleys may be ploughed deep, and in this case, at the last hoeing, the plants are left well earthed-up.

I shall subjoin the opinion of the Rev. Mr. Cooke, on certain implements, and their use in preparing the land for drilling: the agricultural reader will have it in his power to form a judgment thereon, from actual experiment. I particularly recommend to the farmer's notice, Mr. Cooke's method of using the harrow.

The mechanical power, called *The inclined Plane*, constitutes the true principle of the *common Plough*.

"From the imperfections which I observed in the work of common ploughs, some furrows being set too much on the edge, others laid quite flat, (both extremes equally wrong,) I concluded that their medium could not be far from being right; I therefore fixed on the angle of five and forty degrees, for the form of the fore and hind parts of the plough, with a mould-board uniformly twisted, as best adapted for taking up, or raising the furrow, with the greatest ease, and delivering it with the greatest regularity.

"Being satisfied with the principles of this plough, and that the exact form might be preserved, I had it cast in iron, with the land and furrow sides growing together, which renders it not only strong and durable, but unalterable by workmen. It is made without wheels; but I prefer wheels, two before and one behind, a deal of friction being thereby obviated, and consequently less draught required.

"The strongest proof of accuracy in the construction of any plough, consists in every part of the mould-board bearing an equal resistance to the approaching furrow, which is ascertained by every part of the mould-board receiving an equal polish from the friction of the furrow.

"*The Cultivator* may be considered as an appendage to the drill, being applied to the drill axes when at work. It is particularly useful in making clean fallows of all descriptions, at half the expense of ploughing, &c. It consists of a diagonal beam, with from three to seven shares of different sizes, for various uses, applied to two handles, by which it is guided laterally, and may also be forced into the ground, to any given

depth, at pleasure. It is used as a substitute for ploughing and harrowing, by tearing or lacerating the soil internally without tearing a furrow. The narrow shares or scarifiers, are, in some cases, used for obtaining a tilth in light soils without ploughing at all, and the broad shares for cutting up a fleece of weeds, and afterwards leaving them to perish at the surface of the land.

"In strong compact soils, if land is ploughed once before winter, or early in the spring, the remainder of the business, in making a clean fallow, may be performed without repeated ploughings, better than with them, and at half the expense. By the action of *the Plough*, some weeds are turned down and buried, others are transplanted; by the action of *the Cultivator*, they are all brought up to the surface, and left there exposed.

"In preparing land for barley, &c. after turnips, I cannot consider the plough and harrow of any other use than to attain a proper tilth or pulverization of the soil, all which may be obtained by a proper and seasonable use of the cultivator, in half the time and at half the expense, with the richest and clearest portion of the soil left on the surface, for the reception of the seed; instead, as in the first instance, of its being turned down by the plough, out of the reach of the fibres of plants; and a raw and less fertile soil brought up, for the reception of the seed.

"I never see common *harrows* at work, but I am presented with ideas of awkwardness respecting the process and danger, both to men and horses; both which are obviated in my practice, by *applying a proper harrow to the under side of the coulter beam of the drill.* The harrow, in that case, supplies the place of the coulters, and may be lifted up at pleasure, to discharge the accumulated weeds, or forced down, so as to overcome the resistance of compact soils; and by being lifted up at the ends of land, it clears off the ground, and all danger, while the horses are turning round, is thereby done away." *Foot's Survey of Middlesex.*

Dr. Darwin's Phytologia did not come abroad until after publication of the first edition of this work, but I have since perused it with the utmost pleasure, and I hope with profit, which indeed every attentive reader may reap, in full measure, from the writings of that profound and indefatigable investiga-

tor of nature's secrets. There is something, in my ideas, exceedingly conciliating and inviting, in the manner of this celebrated Doctor; his perpetual quotation of authorities is at once highly useful, and a signal proof of a noble and ingenuous mind, fully confident of its own great original powers. In a former work, if I took the liberty to question certain principles maintained in *Zoonomia*, I also was beholden to that great work for instruction on many points, which I failed not to acknowledge. Neither had I seen the two quarto volumes of Communications to the Board of Agriculture, from which so much various and important information may be derived.

The best advice I can give to the scientific cultivator, is to provide himself with Dr. Darwin's book; but to those who have not seen it, I shall occasionally present a few quotations, which may lead to useful purposes.

I had omitted to quote the practice of the illustrious Norfolk husbandman, T. W. Coke, Esq. of Holkham, but can now remedy the inadvertence from Dr. Darwin's book.

"Mr. Coke, of Holkham, in Norfolk, assured me that in thirteen years experience on a farm of 3000 acres, he had found the drill-husbandry in that country, greatly superiour to sowing seeds of all sorts by the hand, in what is termed the broad-cast method, but differs in the number and arrangement of his rows from the method of Mr. Tull, in the following circumstances.

"Mr. Tull drilled two rows of seed a few inches from each other, and then left a space of two or three feet, and then drilled two more rows near each other, for the purpose of passing a hoe between each double row, drawn by a horse, which was therefore termed a horse-hoe; but Mr. Coke drills all his rows of wheat and peas nine inches from each other; this is performed by a drill-plough made by the Rev. Mr. Cooke, which drills six rows at a time and thus sows an acre of land in an hour, and is drawn by a single horse; and the quantity of seed consumed is about six or seven pecks to an acre, which is about half what is used in the sowing by the hand, in the broad-cast method.

"Early in March Mr. Cooke uses the hand-hoe, which for hoeing the rows of wheat and peas is about six inches wide, and for hoeing those of barley, about four inches wide. By this

hoe the surface is not only turned over, and the weeds between the rows rooted up, but it is also accumulated about the roots of the growing corn, and covers and consequently destroys the low growth of poppies amongst them, which are a very frequent weed in that part of the country. A second hoeing is performed about the middle of May, and the soil is again not only cleared from weeds, but accumulated against the rising corn, each of which hoeings costs about twenty pence an acre." Pa. 438.

"Nevertheless I am informed that some attentive agricultors use the horse-hoe, belonging to Mr. Cooke's drill-machine, though the rows of corn are but nine inches from each other; and assert that this occasional trampling of the horse, on the young plants, is of no very ill consequence, a circumstance well worth observing, as it removes the principal disadvantages of the horse-hoe, which consists in the too great distance of the alternate rows of the corn-plants.

"By the earth being thus accumulated against the roots of the corn, it is said to tiller, or tellure much, that is, to throw out four or six stems or more, around the original stem, and thus to increase the number of ears, like transplanting the roots; insomuch that Mr. Coke obtains by this method, between four and five quarters of wheat on every acre, which in the broad-cast method, did not yield more than three quarters an acre, besides saving a strike and a half of the seed-corn, unnecessarily consumed in the broad-cast method of sowing. To this should be added another advantage, that as the land is thus kept clear from weeds, and has its surface twice turned over, and thus exposed to the air, it is found to save one ploughing for the purpose of a succeeding crop of turnips."

Here we have another most respectable and irrefragable proof of the immense superiority of the drill, over the broad-cast husbandry. I have before observed, that I always feel the propriety of bringing forward the experiments of eminent and well-known cultivators, in preference to any memorandums of my own, not always for want of such; I have seen Cooke's drill very successfully used in a shallow calcareous soil, where, according to the opinion and practice of Mr. Coke, the hand-hoe was preferred. In very light soils, where the hand-hoeing can be given as deep as the soil will admit, it may be doubted

whether hand-labour be not really preferable, and whether it be worth while in narrow intervals, to incur the unavoidable (if small) damage, of the treading of cattle; I say this without at present giving up my opinion, as to the preference due to wider intervals, and to the horse-hoe.

I had attributed to Mr. Ducket, the invention of the multiplied shares for the purpose of hoeing a number of rows at once, without at the instant recollecting, that Ellis had used and recommended them long before; and I have since read in the Board Communications, that such practice has been long known in some parts of India. On those soils, where hand labour is preferred, the improved hand-hoe, already mentioned, will be found of material consequence.

Dr. Darwin observes—"By the earth being thus accumulated against the roots of the corn, it is said to tiller, or tellure much, that is, to throw out four or six stems or more, around the original stem, and thus to increase the number of ears, like transplanting the roots." It has however been observed, that drilled corn is apt rather to over tellure, by which the original root becomes exhausted and less productive of seed-bearing stems; an effect which I have not witnessed; but I am inclined to believe, that the superiority of drilled corn arises rather from the weight, than the greater number of ears.

The Doctor quotes Mr. Kirwan, for the opinion that clay, in its usual state of dryness, can absorb two and a half times its weight of water, without suffering any to drop out, and retains it in the open air, more pertinaciously than other earths; but that in a freezing cold, clay contracts more than other earths, squeezing out its water, and thus parting with more of it than other earths. Every practical man will agree with Mr. Kirwan in this observation, but the conclusion drawn from the premises, namely, that clay, either from the drying effects of frosts or sun, 'becomes less adapted to the purposes of agriculture,' I will venture to assert is not equally fortunate or just. Whoever has attended to the working of clays, after a frosty winter or a wet one, or after a dry summer and a wet one, will not be at a moment's loss to form an opinion. The retention of moisture is the grand disadvantage of clayey earth, for however dry it may have been rendered by the weather, a very few showers will make it fit to work. Clay is unsuscepti-

ble of tillage in either extreme, but that of moisture is of infinitely the worst consequence. Without having recourse to the existence of nitre in the air, I conceive the old practical idea to be perfectly correct, that the winter's frost ameliorates the soil in various ways, and most particularly that which is argillaceous.

LETTER RESPECTING THE DANVERS PRIZE COW.

BY E. HERSY DERBY, ESQ.

[To the Recording Secretary.]

[*See Plate.*]

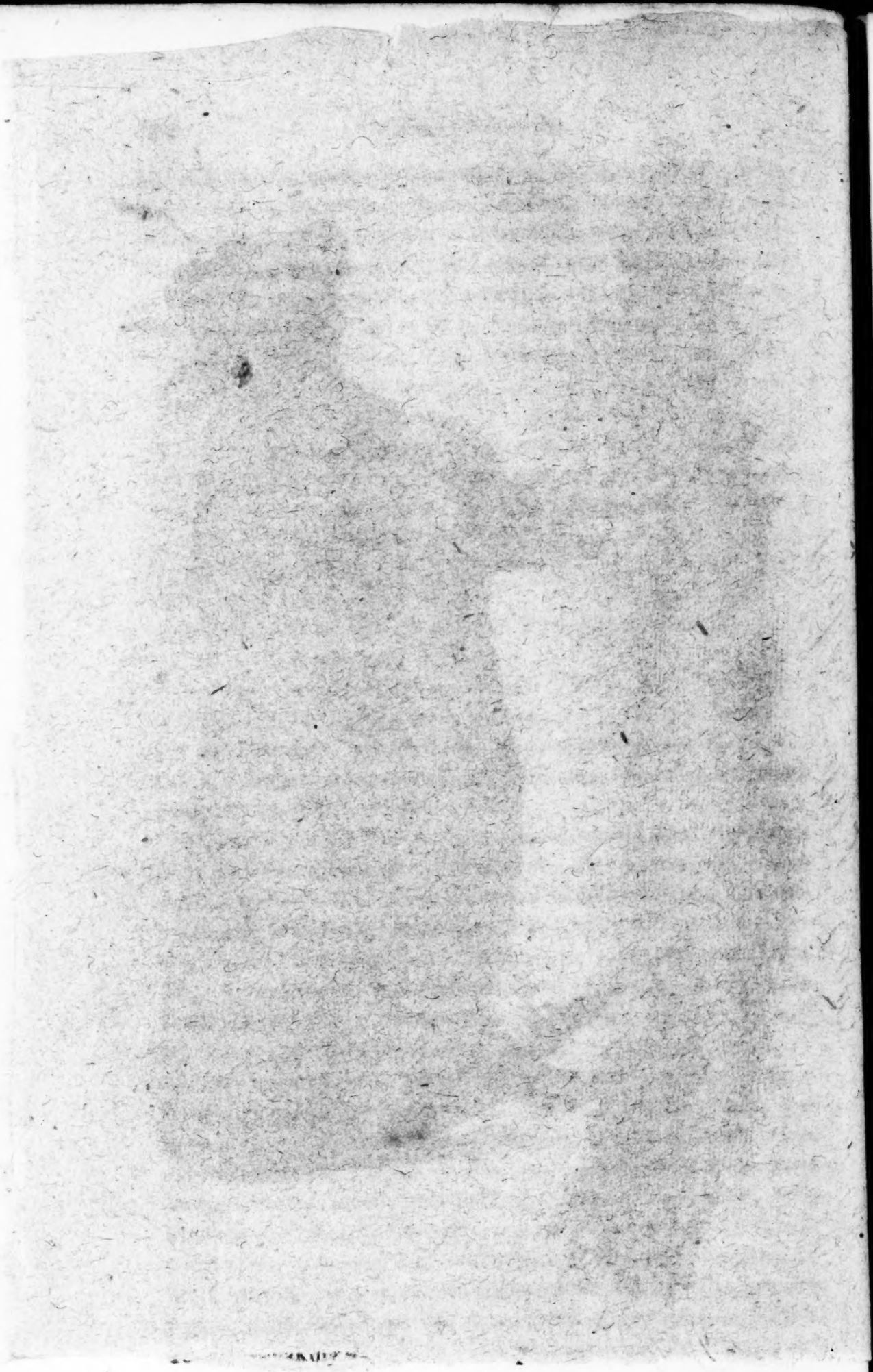
Salem, December 25, 1816.

DEAR SIR,

I FORWARD you, agreeable to the request of the Trustees, the information I have obtained respecting Mr. Caleb Oakes' Prize Cow.

The Cow is of a dark red, and rather under size. She was first purchased out of a drove. Mr. Oakes bought her, in April, 1813, of his brother-in-law, at which time she was five years old. He made from her, the first year, without any extra feeding, 180 lbs. of butter. In 1814, he gave her about 10 or 12 bushels of meal, and made 300 lbs. of butter. In 1815, he allowed her 30 or 35 bushels of meal, and the quantity of butter made was over 400 lbs.

Last spring I called on Mr. Oakes and requested him to keep a particular account this year of the product, in milk and butter, which he has been so obliging as to furnish me. She calved the 5th of April. The calf was killed the 8th of May; being remarkably fine and fat veal. Through the season she has had good pasturage, and has been allowed one bushel of meal per week, and *all her skim milk.* Some time in June or July, Mr. Oakes weighed the milk—at which time she gave, at night, 10 quarts, weight 26½ lbs.—7 do. in the morning, weight 18 lbs.—making 44½ lbs. of milk per day.



Parkers Prize Cow.

Statement of the Butter made this season.

Before the calf	July 17—16	October 2—16⅜
was killed, 17 lbs.	24—16	15—15
May 15—14½	31—16	21—16
22—16	August 7—15	29—16
28—17½	14—15	Nov. 7—16
June 5—19	21—16	18—18
12—18½	28—15	23—10
19—17	Sept. 4—15	30—13
26—18	11—16	Dec. 10—14
July 3—18	18—12	20—10
10—17	25—15	
		Total, 484¼ lbs.

Since Mr. Oakes has had the cow, she has suckled four calves, over four weeks each, and furnished about one quart of milk per day, for the use of the family. I purchased of Mr. Oakes some of this year's butter, I think I never saw finer.

I am, &c.

E. HERSY DERBY.

Note.—December 28th, 1815; eight quarts of milk per day.

Successful Culture of Turnips, on land broken up after haying. Use of Plaister of Paris.—Swedish Turnips.

BY JOHN PRINCE, ESQ.

[To the Corresponding Secretary.]

DEAR SIR,

FINDING at the commencement of the last hay season, that there would be a small crop, and not knowing any better means (at that late season) of providing additional food for my stock of sheep, &c. I thought it would be advisable immediately after taking the hay from the field first cut, to plough the ground (which I intended to break up in the fall) and prepare it for turnips; this was the first week in July. Not having any rain till the 20th, I then harrowed in, on about 1½ acres, eight loads of compost manure, and on the 23d sowed the seed, one half of the common flat, and the other English Norfolk turnips. They had one good hoeing and thinning out, and at pulling I

had near five hundred bushels. I do not consider this a large crop, but as I had already taken a tolerable crop of hay, feel myself compensated; more especially as the land is in better order for corn and potatoes the next season. Having succeeded so well, I shall be induced to adopt the same method in future. This land had not been ploughed for eighteen years, and had considerable couch grass, or I should probably have had a greater yield.

Adjoining this piece, I sowed at the same time, some Swedish yellow turnips, which had not time to come to perfection, and I now think should be sowed in the spring to ensure a full growth, when I am confident they will prove a valuable crop. I raised since in corn hills, sowed at the same time with the corn, (which turned out well,) one or two only in each hill. The turnip seed was steeped in *train oil and sulphur*, it in consequence was longer coming up; but when up, grew rapidly, and was not attacked by any insect.

On one of my grass fields, of about three acres, I sowed in April two bushels of plaister of Paris per acre. At mowing my people acknowledged we had quite as much grass, as on the same field the last year. This was the only one, which produced two thirds of what the same fields gave the last season; I therefore feel convinced the plaister had a great effect, and intend the next year to put three or four bushels per acre on most of my grass fields, notwithstanding the prevailing opinion, that so near the salt water it would have no effect. I have used it occasionally on my pastures for three or four years past, and am fully convinced they are much benefited, as they now produce largely of white clover.

Yours respectfully,

JOHN PRINCE.

Jamaica Plain, Dec. 28th 1816.

ON NEAT CATTLE.

[Communicated by the President of the Society.]

[The following, on Neat Cattle, is extracted from a Treatise on Domestic Animals, by Mr. John Lawrence, dedicated to the Right Honourable John Lord Somerville. It contains many useful observations respecting the selection of the best breed of Cattle, in several counties in England, and the marks for the best milkers, and for beef. Also, some account of the advantages of crossing, and a fine description of the male, whose qualities he thinks of much more importance, for improving the breed, than those of the female. I have made this selection under an impression that it may be highly useful to the farmers in this country, who wish to pay attention to this highly valuable species of stock.]

AARON DEXTER.

All those animals which we style domestic, must have been, originally, wild. Some of them are, even at this day, in a state of nature, in various countries. The reason and the art of man, to which nature has submitted all things, constantly subduing the beasts of the field, select such as appear most profitable, and best adapted to the domestic state. In point of utility and profit, no animal can stand in competition with the Cow; a sentiment which has been universal from the primitive ages, and which, to this moment, has lost nothing of its force or truth. Her milk, so indispensable to civilized man, is her most precious product, of which, the value in various forms, is universally understood. Of this real liquor of life, more valuable than the richest wines, the cow will give the amount of many times her weight in the course of a year, and every year she continues in a constant state of reproduction, unto the end of life, when her last gift to man is food of the most substantial kind, and so many articles of various use, that no part of her carcase need be wasted or lost. The worth of these replaces, probably doubles, her original cost.

The age of neat cattle is determined by the teeth and horns. They, as well as sheep, are destitute of teeth in the upper jaw. But the mark of age, as in the horse, is to be found in the corner incisory teeth of the lower jaw. The first front teeth, or

calves-teeth, remarkable for their whiteness, are shed at two years of age, and replaced by others not so white. Every succeeding year, two other calves-teeth, next to the front, are also replaced, and at five years old, the incisory or cutting teeth being all removed, are of good length, whitish and even, and the beast is full mouthed. From this period, the teeth are gradually filling up, until six years, when the mark is complete. The teeth afterwards become discoloured by age, and sometimes long and irregular. The indications of age from the horns are as follows. In the fourth year of the bullock's age, a kind of button or ring appears near the head, as the bud or basis of the horn. In the course of the year this ring moves, being pushed forward by another which succeeds it; a process which goes on to the end of the animal's life—its years being determinable by the number of those rings upon the horns, reckoning three years for the first ring. It is common with dealers to obliterate these rings, by shaving the horns, in order to conceal the age of the beast. The aggregate of our live stock is also much improved in bulk and substance, and blended into more numerous varieties from perpetual crossing.

Polled cattle are said to have been originally introduced from Poland; which, doubtless, may have been the case with a considerable number: but as defect of horns is one of the primitive characters of the genus, it is not improbable that there existed originally a mixture of hornless cattle, although they are now so blended with other varieties, with which they seem to hold affinity in form and qualities, that it is impossible to discover the real prototype. When it is asserted that this or that were the original race, it can only mean in a restricted sense; since there can be no doubt but there existed a considerable number of breeds or varieties in the earliest times, of which the breed quoted may have been one.

THE FORM OF CATTLE.

General symmetry and harmony of parts, that is to say, an equal and proportional union of length, depth, and substance; the head not large or long, but neatly shaped, eyes full and clear; neck not long, but inclining to thinness, decreasing, or tapering towards the head; chest full and wide; legs by no means long, fore ones straight, the shanks clean and fine; feet

even and sound, the toes turned neither in or out, girth deep; back and loins straight and broad; belly capacious, without swagging; quarters deep and capacious, the flesh reaching down to the hocks; from which, the legs forming an angle, the feet will stand sufficiently under the loins; distance as great, at least, between the hinder as fore feet.

MR. CULLEY'S DESCRIPTION OF A BULL.

The head of the Bull should be rather long, and the muzzle fine; his eyes lively and prominent; his ears long and thin, his horns white, his neck rising with a gentle curve from the shoulders, and small and fine where it joins the head; his shoulders moderately broad at the top, joining full to his chine and chest backwards, and to the neck vein forwards; his bosom open, breast broad, and projecting well before his legs; his arms, or fore thighs, muscular, and tapering to his knee; his legs straight, clean, and very fine boned; his chine and chest so full as to leave no hollows between the shoulders; the plates strong, to keep his belly from sinking below the level of his breast; his back, or loin, broad, straight, and flat; his ribs rising one above another, in such manner that the last rib shall be rather the highest, leaving only a small space to the hips, or hooks; the whole forming a round or barrel like carcase; his hips should be wide-placed, round or globular, and a little higher than the back; the quarters, from the hip to the rump, long, and instead of being square, as recommended by some, they should taper gradually from the hips backwards, and the turls or pot bones not in the least protuberant; rumps close to the tail; the tail broad, well haired, and set on so high as to be on the same horizontal line with his back. Hago, the Carthagenian, has transmitted to us his opinion, that such oxen are to be purchased as are young, square, with huge members, lofty horns, and somewhat blackish and robust, with a broad and curled forehead, hairy, rough ears, black eyes and lips, wide nostrils, turned up nose, a long and brawny neck, large dewlaps, and almost hanging down to their knees, a great breast, vast shoulders, a capacious belly, and, as it were, great with young; extended sides, broad loins, a straight and even back, or somewhat subsiding, round buttocks, with compact, well set, and straight legs, but rather shorter than longer, and not with

big and ill shaped knees; with great hoofs, and exceeding long, bristly tails, and the hair of their whole body thick and short, of a red or dark colour, and exceeding soft to the touch.

By improvement of the breed of animals, is meant the gradual change of form and properties in their progeny, until they shall arrive, as nearly as possible, to a certain standard of presumed perfection. This is to be effected on the principle of like producing like by a conjunction of male and female, of the desired species, form and properties, some steps or points being gained by procreation. The male of course being able to multiply likeness to such an extent, must be the prime instrument in the business. It is, therefore of the utmost consequence, that he be thorough-bred or thorough-shaped, and the female ought to be selected with the strictest care, since although her qualities cannot be considered of so great consequence as those of the male, her likeness being restricted to an individual or two, yet, it must not be forgotten, that perfection is not to be attained but by perfection on both sides. In this particular the common breeders are very liable to err.

Nothing can be more groundless than the notion that all breed goes in at the mouth, inferring that all excellence depends on keep. It would be equally rational to say, that size and form depend on food. No fact can be better established than the reality of specific properties, and the superiority of one breed over another. The formation of an entire new breed, or the establishment of a permanent variety, it will immediately occur, is a matter requiring the most diligent attention, through a long course. For that reason it is infinitely the shortest and safest course to part entirely with an inferiour stock, or such as requires much amendment, and to replace with a species, the nearest to perfection, at whatever price. This will account rationally, for the high price of certain well-bred individuals, which may be strictly their due.

Long experience has proved the old notion of the necessity of crossing or interchanging the species of animals and seeds, in order to prevent degeneration, totally groundless. You may breed forever, in and in, or from the nearest affinities of blood, with the utmost success, provided you select with judgment the best shaped individuals; and the finest animals in this country have been bred in this mode. In truth, since like

produces like, the best shaped, however allied in blood, must be the most proper for conjunction. A cross for the improvement of forms is a very different, and may be a very necessary measure; yet crossing is said, and probably with truth, to produce in the first instance larger size, and improved temperament. All animals will fatten early and quick in proportion to the smallness of their bones, with the disadvantage, however, of running too much to fat, and falling short in the quantity of solid flesh, of course in weight. Hence the private advantage is not so great as generally supposed, and the public disadvantage sufficiently apparent. Large bone, and a well shaped capacious frame, are necessary to the growth of flesh; and fat in plenty, both externally and internally, will follow, granting sufficient time be allowed. Tallow or internal fat, which denotes the ripeness of the animal, results from mature age, length of keep, and probably, from size of bone and depth of carcase.

It has been observed, that the northern short-horned species is the largest breed in Britain, the Hereford standing in the second place in that respect. The short-horns are an original species, but whether those of our northern countries are so or not, cannot now be ascertained; that is to say, whether they are aboriginal, or were imported in very early times, as we know they have continually been found during several centuries. The northern short-horns led to the introduction of Norman or Alderney bulls, at some period of the eighteenth century, with the precise date of which we are unacquainted. This improvement commenced in Holderness, Yorkshire. Never was there a more fortunate cross. In no other country does exist so excellent a breed of cattle as those of Holderness, including all the useful properties. In one, perhaps the most important respect (great milking) they are superiour and even without rivals. Their beef is finer than that of the old short-horned breed, and they fatten much earlier and quicker, carrying still a vast depth of natural flesh, and tallowing within, in the first degree. They have both speed and strength enough for labour, and their shoulders are well formed and well placed for draught.

The northern half long-horns are the immediate produce of a conjunction of the long and short horns, which must of necessity frequently happen upon, and in the vicinity of, these moun-

tains, which separate the native district of the two species, to wit, Lancashire and Yorkshire. The horns of this variety are pretty straight and even; unlike those which are called middle or wide horns. The half long-horns are a large and long breed of cattle, partaking equally, as may be supposed, of the qualities of each species, and thence ought to be good dairy cattle, as uniting quality and quantity of milk and size. In fact, I have been assured by an intelligent Essex dairyman, that they have the best title to such character; and many years since, when cow stock was at a low rate, he preferred going to the price of sixteen or seventeen guineas a piece for this description.

The northern, or Yorkshire polled cattle, have the same qualities as the short-horned cattle, carrying vast substance, and some I have seen lately are of great size, although in that particular, they are most conveniently various: in my opinion, they are a most excellent breed, and well merit improvement, as working cattle, by a selection of the finest boned and most active individuals.

The Alderney and Norman cattle on the French coast, are, I believe, collectively known by the name of Alderney; these are a variety of, and smaller than the Norman, light red, yellow, dun and fawn coloured, short wild-horned, deer-necked, with a general resemblance to that animal; thin, hard and small boned, irregularly, often very awkwardly shaped. This description refers chiefly to the cows; they are among the best milkers in the world, as to quality, and in that respect are either before or immediately next to the long-horns; but in weight of butter (for their inches) they are far superiour to all. I have been assured by a respectable friend, that an Alderney strayed cow, during the three weeks she was kept by the finder, afforded nineteen pounds of butter each week, and the fact was held so extraordinary, as to be worth a memorandum in the parish books.

The Norman and island cattle make fat very quick, and for their bulk, arrive at considerable weight. The beef is of the first class, very fine grained, in colour yellow, or of that high colour with a blueish cast, and elastic feel, which denotes the closest grained, most savoury and finest meat.

Cheshire is not numbered among our breeding counties, nor is any species of stock thence denominated, unless we adduce their justly celebrated breed of cheese. They nevertheless breed a great number of cow cattle for their own dairy use, and perhaps no where are to be found such a medley and jumble of different races. Lancashire long-horned, Holderness, Shropshire, Welch, Irish, Scotch, Stafford, Derby, New-Leicester, have all been periodically introduced into the Cheshire dairies, and their present home breeds are a mixture of all these. Should these become known as a settled variety, no term could be more appropriate to them than the *omnium gatherum* cows. Milking seems to be the sole object in rearing here; their favourite points are "large thin skinned udder, and full milk veins, hide not material, shallow and light fore quarters, capacious behind, wide loin, thin thigh, white horns, long thin head, brisk and lively eye, fine, clean chops and throat—general symmetry and beauty no objects."

With respect to purchased stock, they prefer on experience the broad-horns, by which I suppose they mean the half long-horns, or the produce of the Lancashire long and Yorkshire short-horns, forming an union of quality and quantity of milk; these for their richest pastures. For their poor soils, they have a short-legged breed, hardy and of inferiour size, resulting from a Welch cross.

They prefer their home breed for their dairy, experiencing, that purchased cows do not reach their full milking until their second year, if they come from poor land. They hold cows to be in their prime, from four to ten years old, and keep them as long as they milk well, indeed until they are fit for nothing else. I mean to make the exception of capital milking, which I should be tempted to keep even to twenty years of age. But I yet think generally, cows are not at their best until five years, and on their decline at eight; when I apprehend it must be the interest of a dairyman to sell or put them to keep. I think few can suffer such an exhaustion as constant milking to the eighth year, without deterioration. The farmer himself attends the milking, assists in carrying the milk, and observes particularly, that the cows are well dripped, or the udder well cleared of milk, for should any be left it would not only be the richest of the milk, ("each succeeding drop which a cow gives at a

meal, excelling the preceding one in richness") but such negligence has the effect of causing a cow to become gradually dry.

For the milk-house a northern aspect is preferred, and it is desirable that it should be so sheltered by buildings or trees, as to divert the sun's rays through the whole day. An uniform temperature of the air within ought to be preserved the year round. In winter a stove would effect this, in summer the end would be effected by pouring spring water on the floor; and water should ever be at hand in a dairy; the expeditious cooling of the milk in summer has considerable effect in retarding its acidity.

The quantity of cheese made from one cow, in the season of twenty-two weeks, from April or May, about 300 or 500 pounds and upwards, the former quantity accounted a good average, for dairy accidents included. One gallon of milk makes one pound of cheese, and the dairymen are better satisfied with a cow that gives only eight quarts per day, through the season, than with that which gives a greater flow; in which case, it is proved, the milk is generally thinner, and less productive of good, and the cow liable to go earlier dry.

The object in the choice of cows, is to obtain such as will produce the largest quantity of butter or cheese, and beef. The various uses of the cow, are breeding, the manufacture of butter and cheese from the milk, feeding the swine from the skimmed milk or whey, suckling or fattening calves for veal, and sale of the milk, which is chiefly carried on in large towns. By the last, obviously, the cow renders the largest profit, amounting indeed in a good milker, to a great number of pounds annually. The butter and cheese dairy, aided by the profit of pig feeding, may be considered next in emolument to the sale of milk, and suckling in the last place; this is however managed, at the least trouble and expense. Local circumstances and inclination will determine the proprietor's choice in the application of his cows. But the nature and produce of the soil ought to be the farmer's guide, as to the extent of his dairy, since a dry upland situation adapted to sheep stock, is by no means calculated for milch cows, which require the succulent grass, and full bite of meads, or of rich and luxuriant pastures, with easy access to good and plentiful water, without the necessity of harassing the cows, by driving them

any distance to obtain it. For the first purpose, or milking for the sale of milk, as quantity is plainly the chief object, and not consistence, or great produce of cream, the deepest milkers must be in request. These are to be found in the Holderness variety of short-horns, or proportionally, in any variety, to the degree of short-horn blood. The general professed object of the considerable dairyman in the choice of his cows, is the union of deep milking with large size, which last he reckons an advantage in the sale of cows, either for immediate disposal, when exhausted by milking, or after having grazed and fattened her.

The food of milch cows is well known to consist of grass in summer, and hay and straw in winter. Many actual experiments have convinced me that to keep any lactiferous animal with poor or ordinary food, under the idea of economy, is purely deceptive. Nor can any food be too rich, with the exception that tending too much to the production of fat, although it may increase the consistence and richness of the milk, it may yet contribute to retard the secretion of that fluid, and reduce, in too great a degree, its quantity. Nevertheless, in cases of great and excessive milking, or under the usual exhaustion from straw feeding and poor winter keep, many will fail. I am well convinced a good cow would return the cost of a certain quantity of corn continued for a time. The effects of such generous keep will appear in the dairy, and the grazing ground, or fatting stall; and the value of twenty shillings, thus expended, will often render more than a five fold return. Cows may be summer fed with the artificial grasses, lucern, sainfoin, clover, or with tares or green corn, cut and carried to them in the home-stall, or to any shaded and watered ground; and this method gives a facility to cow keeping in upland situations. It is affirmed by theoretical writers, that to feed cows in this way, increases their quantity of milk; a fact which various experiments compel me to disprove. With me it has ever had the effect of adding to the substance of the animals, and of diminishing the quantity of milk; probably from defect of the exercise they were wont to take, in collecting their food.

The milk product of a cow is extremely uncertain. The great expense to keep her well is equally certain. Hence the importance of a judicious choice. Inadequate keep pretty

nearly levels all distinctions of good and bad, or rather most degrades the former. Some have entertained an opinion, that it is the food exclusively which confers a superiority of milk product upon the cow; a mere supposition, which may be converted into a certainty, by the experiment of two cows of equal size and age, one of a milky breed, the other of different repute, or a common mongrel kept at full allowance of the best food. Mongrels are kept in some districts; a jumble and medley, bred from the refuse of all sorts, which devour the best produce, at least in the summer season, without producing more than half the quantity of milk which might be drawn from a good milch cow.

It has been said, that on an average, three gallons of milk will make a pound of butter, or three pounds of new-milk cheese. A thorough dairy woman, at my elbow, says the latter is far nearer the truth; that the former is very uncertain, depending on the nature of the cow, the quality of the food, the season, and the age of the milk, which in course loses much of its consistence, as it is distant from the period of calving. Certain capital individuals of the long horned breed, have, in the prime of their milking, and in the summer season, produced twenty and even twenty-two pounds of butter per week. A fact however so uncommon as to have few witnesses; such an one I suppose will afford, on an average, twelve or fourteen pounds per week through the summer season, and afterwards, until she become dry, eight or ten. I would travel some hundreds of miles to purchase so rare, and, on many accounts, valuable an animal. A good, fair dairy cow will produce, from her calving in May until the approach of winter, an average of seven pounds of butter per week, from the quantity of three to five gallons of milk daily. Winter weekly average of butter, four pounds. From an inferiour cow, the winter product is scarcely worth the trouble of calculation, and never worth charge of her keep.

Cattle ought not to be turned to pasture in the spring, until the herbage shall have attained sufficient maturity and luxuriance; in the usual phrase, until there is a good bite. And if it consist of the artificial grasses, great precaution is necessary at their first meal, least they gorge themselves to excess and become hoven, or in danger of bursting; to which they are still more liable than oxen.

FIELD CULTURE OF WHEAT, RYE, CORN, &c.

BY GORHAM PARSONS, ESQ.

[To the Corresponding Secretary.]

Brighton, January 4, 1817.

DEAR SIR,

THE following particulars of the manner of cultivating, and the produce of my wheat, rye, corn, &c. are taken from my interleaved Almanac. If, considering the extraordinary season last year, the facts are thought worth communicating, they are at your disposal.

The ground on which I sowed my wheat and rye was well ploughed (as was all my tillage land) the fall previous; and in the spring, as early as the plough would pass through it, before the frost was entirely out, crossing the furrows of the former ploughing; it was then ploughed again, after which it was harrowed, and thirteen ox-cart loads of manure put on each piece, and ploughed in quite deep. The manure was green from the barn cellar, and had not gone through a fermentation. The ground was then harrowed and the lumps thoroughly broken, after which the wheat and rye were sown, being previously soaked in weak lie twenty-four hours, and when drained off, covered with plaister of Paris, rather more than would adhere to the kernels. When sown, the ground appeared quite white. The grain was then ploughed in with a small seed plough, covering it about four inches. Herds grass and clover were then sown, lightly harrowed with a small iron tooth harrow, then passed over with the brush harrow, and made smooth with the land roller, pressing all the small stones below the surface.

Both wheat and rye came up well and grew rapidly, and did not appear to be affected by the repeated frosts, after it was out of ground several inches.

The rye (two bushels) was sown the 15th of April, on *one acre, one quarter and four rods*, and yielded *fifty-two bushels and an half* of clean, sound grain, weighing fifty-six pounds to the bushel.

The wheat (two bushels and an half) was sown the 20th of April, on *one acre and sixteen rods*, and yielded *thirty-eight bushels and an half* of well cleaned grain, weighing fifty-eight pounds and an half per bushel. The kernel I thought not so large and full, as that which you raised the same season; it however makes good flour and very sweet bread, and when well washed before grinding and bolting, is as white as the average of Baltimore fine flour.

The soil on which the wheat was sown was a yellow loam, rather shallow; that of the rye, a part rich and deep, the other part shallow and light, with a mixture of gravel; on the poorest ground the rye was decidedly the best. At one time I feared that neither wheat or rye would produce any kernel, and attributed it to the green manure, which had forced it too rapidly; the result however was different from my expectation, but the stalks of the rye in particular, were very high, more than five feet on the best of the ground.

No other attempt was made in this town the last year to raise spring rye, and but one other to raise wheat; that was by one of my neighbours, who sowed about half an acre, but did not get the seed in till the middle of May; to that cause I impute its being blighted, as it began to fill out in July, when we had a short spell of sultry damp weather; he mowed it and used it for fodder without thrashing.

I am fully satisfied that to raise spring grain, particularly wheat, in this neighbourhood, it must be sown very early, and for that purpose, fall ploughing aids very much. I sowed Persian Barley on three quarters of an acre of ground, it was considerably lodged, but entirely free from any rust or blight; it yielded twenty-seven bushels of very handsome sound grain, which weighed sixty-one pounds and an half to the bushel. A greater quantity of the common barley is raised, but I doubt if it yields so much weight of grain to the acre. Some of the best common barley raised in my neighbourhood, weighed only fifty pounds. My farm is generally laid down to grass; and as I renew that which is most run out or exhausted, I prefer planting potatoes to bring it into heart, and the last season I planted but a small piece of corn; it was estimated at one acre and an half, was well ploughed in the fall, and twice in the spring, the soil a rich yellow loam, manured with ten large loads of green

manure, planted the 13th May, the seed soaked in weak lie, and covered with plaister of Paris. This ground was high and sheltered by trees on the north and west, and from the N. E. winds by a hill. The frosts of the 9th,10th and 11th June, affected the leaves of the young corn considerably. The mercury of Fahrenheit (before sun-rise,) 39, 38, 37, falling one degree each night. (We had ice in the tub at the pump on the morning of each of those days.) After the parts injured by frost began to dry, I took pains to have them cut off with shears and scissors, but consider it labour lost, as a few hills not clipped did quite as well. After weeding, I put five bushels of unleached ashes around the corn—perhaps half a pint to a hill, and the same quantity at half-hilling. It was very little affected by the frosts, until that of the 28th September, which was very severe, (the mercury at sunrise being at 29)—a part was considerably injured ; but near half the corn was so forward as to receive but little injury. It was of that species, of which the husks, when it begins to harden, fall from the ear ; which accelerates its ripening. Many persons not acquainted with it, have supposed the ears stripped by hand, as it is left as free from husks as if that operation had been performed. Before gathering the corn, I selected those ears that were well filled out quite to the top of the cob, and where two grew on a stalk ; taking the best of the two for seed. It appears well, and would pass for good seed corn in any season. I gathered from the piece, one hundred forty-seven bushels, (in the ear.) We calculate that two heaped bushels in the ear will make one when shelled. Sixty-three bushels of it were very good, sound corn,—eighty-six bushels injured by the frost, and about one quarter very much injured, and appeared to have lost its nutritive quality. From the same ground I gathered eighteen hundred and twenty-seven pumpkins, a large proportion well grown, of a good size, and fully ripe.

I took a piece of ground in my neighbourhood to cultivate for a share of the produce ; it had been under cultivation five or six years previous ; the soil a rich, deep, heavy, black loam, and low ground. It was not ploughed in the fall, and the frost was not out until late. It was treated, in other respects, in the same manner as my own ground—the same kind and quantity of manure and unleached ashes. It was planted May 15th, with corn, and the long, red, River Plate potatoes, the seed corn

the same as that used on the other piece. The frosts in June affected it very much, turning yellow a large proportion of the young corn quite to the ground. It appeared to recover before the last hilling, and promised better than the other: the stalks were larger and taller—the foliage more abundant—the ears larger and longer, but it was not so forward as the first by a fortnight. The frost of the 28th of September injured it so much, that I did not gather a single bushel of sound corn from the piece. Although pumpkin seeds were sown as abundantly as on the other piece, I gathered only four hundred thirty-four, and but few of those were well grown and ripe. The potatoes, round the edges, measuring one quarter of an acre, yielded sixty-seven bushels, which was better than the average in my own ground. In this town the crop of Indian corn was generally cut off, and very little sound corn, fit for bread, raised.

I weighed, this day, a bushel of my corn of last year and a bushel of that of the year before. That of 1815 weighed sixty-four pounds, and that of 1816, fifty-eight pounds. Respecting our crop of hay in this town, there has been some difference of opinion, but it is generally agreed that on new fields, in good heart, and but a few years down to grass, the crop was equal to that the year previous. If the hay was not as bulky, it was as heavy, and of a better quality. On old fields it was short one third, but the quality very good. Potatoes gave a good crop, and the common barley more than usual.

Yours, &c,
GORHAM PARSONS.

LETTER FROM JUSTIN ELY, ESQ. TO THE PRESIDENT OF THE SOCIETY.

West-Springfield, January 8, 1817.

DEAR SIR,

Your favour of November 20th was duly received, for which I thank you.

The Persian Rye you sent me almost wholly failed: about a pint of poor blasted seed is all that has been saved from it.

I congratulate you on the success in raising summer wheat in your vicinity the past summer.

The largest crop of winter wheat was raised in Springfield, the past summer, that is known ever to have been raised in this vicinity, and perhaps larger than was ever before raised in New-England.

Four acres of land, (one of the house lots in Springfield-Street, belonging to the distillery company,) three years ago last spring, were English mowing. It was manured and ploughed up and planted with Indian corn, and dung put in the hills. The crop was abundant. The next spring it was covered with very rich manure from the distillery, and hemp seed sowed thereon. The crop was large and heavy. The land was then ploughed twice and sowed with the bald wheat, one bushel and four quarts to the acre. The produce was *two hundred bushels* of good, clean, heavy wheat, from the four acres.

About half an acre of the hemp was not pulled with the other hemp, but was suffered to stand till the hemp seed was ripe, whereby the sowing of the wheat, on that part, was delayed too late in the season, which diminished the crop of wheat on that part, six or eight bushels, as supposed.

It is the opinion of many people, that the unprecedented cold and drought of the last summer checked and retarded vegetation so far as to prevent the destruction of the crop by blasts and other causes, and that if the last summer had been as warm and wet as usual, the whole crop would have been blasted and lodged, so as to have been wholly ruined.

I am, &c,

JUSTIN ELY.

ON WHEAT CULTURE, AND THE USE OF PLAISTER OF PARIS AS MANURE.

BY J. LOWELL, ESQ.

[To the Recording Secretary.]

DEAR SIR, *Roxbury, Nov. 21st*, 1816.

I SEND you this account of my experiment on wheat, neither for its magnitude as to the quantity of ground employed, or any thing peculiar in its management or product, but because it

was, and was designed to be, a fair exhibit of ordinary means and ordinary success. You know how fallacious experiments, as to general utility, are, when gentlemen apply to them a degree of labour or a proportion of manure exceeding the capacity of common persons, or indeed any persons, to follow on a large scale. I selected a piece of land, measuring nearly three quarters of an acre; its quality is but indifferent, a light thin soil on a gravelly base. It had been leased to different tenants for six years, and was very much exhausted, having been constantly in tillage, and never surcharged with manure.

I sowed only one bushel of wheat, at least one half less than I should have sown; it was steeped in brine for three days, limed, and sown with one bushel of plaister of Paris. The crop was 16 bushels of very fair, full and heavy wheat; that is about 22 bushels to the acre. The whole labour was about ten days of one man, including sowing, reaping and thrashing. What crop of indian corn, even of 50 bushels to the acre, would produce as much profit? Two acres of wheat would supply almost any family with its bread stuff, and of much better quality than what is generally eaten by our farmers. Yet we go on paying ten per cent freight, and eight per cent commission and profits, for the first necessary of life.

I tried gypsum, or plaister, on many parts of my land last year, and I think with success. The most signal instance was that of a field, which had been laid down to grass more than seven years, and was very much sward-bound. I began on the worst part of the ground, and the person employed to sow it with plaister, instead of three bushels on an acre, as I directed, put the three bushels on a fourth of an acre. The effect was so surprising, that when the trustees of the Society were at my house, I asked them separately to say where the plaister began, and where it ended, and no one failed to point out the precise limits. The crop was double that of the rest of the same piece of ground, and quadruple that of the preceding year.

I am apprehensive, that we have been too impatient, too careless, and too penurious in our experiments with plaister. It is now rendered certain by the experience of many, that the neighbourhood of the salt water forms no obstacle to its use.

JOHN LOWELL.

EXTRACTS FROM TULL'S ESSAY, ON THE PRINCIPLES OF VEGETATION AND TILLAGE.

HORIZONTAL roots, (except those of trees) have seldom any of their branches deeper than the plough or spade has penetrated into the staple of the earth. These roots sometimes extend themselves several yards from the tap-root.

The horizontal roots of plants, being observed to taper very much near their commencement, have been supposed to diminish in the same proportion throughout; and of course, to terminate at a short distance. The fact is, however, that these roots do not discernably taper more than a few inches; after which they hold, to the end, nearly the same bigness.

I have found an extensive small fibre on the side of the carrot, much less than a hair, which, through a microscope, appeared a large root, not tapering, but broken off short at the end, which, it is probable, might (before being broken off) have extended six feet from the plant. It had many fibres growing out of it. I have observed that a carrot will draw nourishment from a distance, by means of roots almost invisible where they come out of the carrot itself.

Roots by being broken off near the ends, increase their number, and send out several where one is broken off. Roots increase their fibres every time the earth is stirred about them. Stirring the earth causes a more rapid growth.

I call the inner superficies, made from dividing the soil by art, the *artificial pasture* of plants. This artificial pasture for the roots of plants may be enlarged without the addition of more land, in proportion to the division of the parts of earth, and this division may be carried on without end.

Suppose a solid cube of earth of one foot, too hard to be penetrated by the smaller fibrous roots of plants, it is obvious enough, that by its entire pulverization, it will afford to these roots, which have penetrated it in all directions, a surface more than a thousand times greater.

Every time the earth is broken by any sort of tillage, there must arise some new superficies of the broken parts, which never have been open before.

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Suppose a solid cube of earth of one foot, too hard to be penetrated by the smaller fibrous roots of plants, it is obvious enough, that by its entire pulverization, it will afford to these roots, which have penetrated it in all directions, a surface more than a thousand times greater.

Every time the earth is broken by any sort of tillage, there must arise some new superficies of the broken parts, which never have been open before.

Great clods are of no use to plants except by the dust they let fall: when pulverized the particles are exposed to be impregnated throughout their whole substance, with the riches carried in by the dews.

As soon as the farmer has done ploughing and harrowing, in the usual mode of culture, the particles of the soil will tend to unite again by their specific gravity, and by little and little close up, and become impervious to the finer roots of plants. This will take place, in a greater or less degree to the depth the plough had penetrated. This tendency cannot, it is well known, be effectually counteracted, by the use of the hand-hoe.

Hand-hoeing is only scratch-hoeing. The horse-hoe, or small plough, keeps the magazines of the earth open, and replenishes them with the dews, which fall most in dry weather, and those dews seem to be the richest present the atmosphere gives to the earth, having, when putrified in a vessel, a black sediment at the bottom. This seems to cause the dark colour of the upper part of the ground.

To demonstrate that dews moisten the land when fine, dig a hole in the hard dry ground, in the driest weather, as deep as the plough ought to reach, beat the earth very fine, and fill the hole therewith, and after a few nights dews, you will find this fine earth become moist at the bottom, and the hard ground all round will continue dry. Of two fields—make one very fine by frequent deep ploughings, and let the other be rough by insufficient tillage; then plough the two fields cross-ways in the driest weather, (when of long continuance,) and you will find the fine ploughed land, on its being turned up, moist, the other dry as powder, from top to bottom.

Although hard land, when thoroughly soaked with rain, will continue wet longer than fine tilled land adjoining it; yet this water serves rather to chill than nourish the plants standing therein, and to intercept the good to be derived from the atmosphere, leaving the ground still harder when it is thence exhaled; and being at last become dry, it can admit no more moisture, unless from a long continued deluge of rain.

As fine ploughed ground is not so long soaked by rain, so the dews never suffer it to become perfectly dry; this appears by the plants which flourish and grow fast in this, whilst those

in the hard ground are starved, except such of them as stand near enough to fine pulverized earth, to draw moisture and nourishment from it.

Good ploughing procures moisture to roots; though the ignorant and incurious fancy it lets in the drought, and therefore are afraid to plough or hoe their plants in time of drought, when, unless they water them, they are spoiled for want of it.

There is yet one more benefit from ploughing frequently and thoroughly. All that can be done in feeding an animal is to give it sufficient food, meat and drink, at the times it has occasion for them. If you give an animal any more, it is to no purpose, unless you could give it more mouths, which is impossible; but in ploughing or horse-hoeing deep, near and round a plant, the additional nourishment thereby given, enables it to send out additional, innumerable additional fibres and roots, which fully demonstrates, that a plant increases its mouths in some proportion to the increase of food given to it.

Ploughing or horse-hoeing can be employed only in the *row-culture*, and as a *preparation* of the land for grass seed, when it is to be sown *broad-cast*. The distances of the *rows* in the *row-culture*, will be found to be one of the leading objections to this kind of husbandry; the interval not being *planted*, much of the benefit of that ground will, it is supposed, be lost, and therefore the crop must be less, than if it was planted all over. I answer:—It might be so if not horse-hoed, but if well horse-hoed, the roots can run through the intervals, and having more nourishment, make a greater crop. This has been proved by repeated experiments.

A too great number of plants, placed all over the ground, in common sowing, have, whilst it is open, an opportunity of *wasting*, when they are very young, the stock of provisions; for want of which, the greatest part of them are afterwards starved. Their irregular standing prevents their being relieved with fresh supplies from the hoe. Hence it is that this method, exhausting the earth to no purpose, produces a less crop, and yet leaves less food behind for the succeeding one, contrary to the hoeing husbandry. In a large field of wheat it was proved, that the widest hoed intervals brought the greatest crop of all. Dung without hoeing did not equal hoeing without dung.

Another objection is, that so small a part of the land as that wherein the rows stand, cannot contain plants or stalks sufficient for a full crop. But since plants thrive and make their produce in proportion to the nourishment they have within the ground, not to the room they have to stand upon, one very narrow row can contain more plants than a wide interval can nourish, and bring to their full perfection, by all the art that can be used.

In wide intervals there is another advantage of hoeing, I mean horse-hoeing, (the other being more like scratching and scraping than hoeing)—there is room for many hoeings, which must not come very near the bodies of some annual plants, except while they are young; but in narrow intervals this cannot be avoided at every hoeing. It is true that in the last hoeings, even in the middle of a large interval, many of the roots may be broken off by the hoe-plough, at some considerable distance from the bodies; but yet this is no damage, for they send out a greater number of roots than before, as has elsewhere been made to appear.

If it be asked, how many hoeings are necessary? I answer—It is not the number of hoeings that determines the degrees of pulverization. For, one well done is twice done; and the oftener the better, if the expense be not excessive.

Poor land, be it never so light, should have the most hoeings; because plants receiving very little nourishment from what I call the natural pasture of such land, require the more artificial pasture to subsist upon.

Horse-hoeing has in truth every year the effect of a summer fallow; though it every year produces a good crop,

It is said of some plants, that they enrich a soil; of others, that they impoverish it. *But I think it may be observed, that all those plants which are usually hoed, are reckoned among the enrichers; and though it be certain that some species of plants are, by the heat of their constitution, greater devourers than those of another species of equal bulk; yet there is reason to believe, that were the most cormorant plant of them all to be commonly horse-hoed, it would gain the reputation of an enricher, or improver of the soil.*

Observations on Manuring, Planting, Grafting, and Pruning, of Trees. Extracted from Bradley's Treatise on Husbandry and Gardening. Published in Great Britain, 1726.

It may be thought singular, that we should attempt to lay before the public, remarks on a subject which may be considered to be already well understood, and still more so, that we should draw them from so ancient a source. The popularity of the work of Forsyth may seem to render such a measure hazardous; and the opinion, that modern improvements have entirely superseded the practice of the early part of the last century, may confirm this opinion. But chance having thrown in our way this early treatise on the management of trees, we are constrained to express our conviction, that it contains as much solid, good sense, as can be found in any modern work of the same extent, and we think the form in which instruction is conveyed, much more suited to practical men.

ON TREATMENT OF TREES.

Observation 1st. If any branch, in the middle of the tree, rises with too much luxuriance above the rest, in full, sappy, wood, we must cut it off close to the body of the tree, but take care we do not injure the bark of the great wood we take it from; for such a wound would endanger the health of the tree, the wounded part would be a long time recovering, and be subject to canker.

2d. There are many people with their pruning knives constantly in hand. But the continual pruning of a tree makes it shoot into false wood, and miscarry of its buds designed for fruit. The reason why trees shoot more into wood when they have been largely pruned, is because the root had filled itself with juices proportionable to the nourishment its standing branches required; but when many of them are cut away, the same fund goes to the remaining buds that was destined to support many more; and thus a too luxuriant growth will be produced on the limbs which are left.

3d. When a tree is in good order, we must take care not to prune it too close, or take away too much wood inside, as some

are too apt to do. We must however take away enough to admit the sun and air into the centre, in order to ripen the fruit. It may be remarked, also, that we must admit more sun and air in a strong or wet soil, than in a dry, sandy one; because the former naturally produces insipid fruit, while the latter generally ripens fruit better.

4th. Winter fruits should have their shoots left wider asunder than summer, the latter not wanting so much sun as the former.

Trees which made weak shoots the year before should be pruned in January, or earlier; but vigorous trees should be pruned late in the year, in April, or even May, in which case they will bring less wood and more fruit.

5th. We must consider the climate in which we live, and direct our practice according to the degree of heat or cold. In hot countries the fruit must be gathered sooner than in colder ones, because the sap has performed its work sooner. Fruit will *keep longer*, the longer it is suffered to remain on the tree. We should gather fruit after a frost, for we are then sure the sap will no longer aid it.

[This last remark or observation is very important. In the interiour parts of our country, the summer is generally more tardy and cooler than on the sea coast. There may be some exceptions, but it is generally true. Do we suffer our winter fruit to hang sufficiently long on our trees? A difference should be made according to the above theory, between hot and cold seasons. We should not fix on a precise day or week of the year for gathering fruit, but should defer it to a later period in such cold seasons as the last. This certainly deserves the attention and inquiry of cultivators of winter fruit.]

6th. In gathering fruits it should be done with care and patience; we should avoid destroying the blossom buds which are near them, or which join them; for the buds are already formed for the next years fruit. Apples are much harder to gather than pears, being more closely fastened to the tree, and with shorter stalks.

7th. In hot, dry years, if it is very hot in August and September, our fruits should be gathered early in October; for such fruit as has had a good share of ripening on the tree, lasts but a short time, and is very subject to rot; but if August and September be very cold, then let the fruit be left on till the last of

October, and it will keep well. I account this one of the most important observations with regard to fruit.

8th. Those who prefer large, fine, fair fruit, should thin the fruit early; and if the tree, in its first or second sap, tends to shoot abundance of wood, it should be pinched off while it is tender and young, but never cut while the sap is flowing, because the tree, by cutting, at that time is apt to run into wood, and the blossom buds are disappointed. N. B. The blossom buds are formed by the first sap, between April and June, and filled by the second, between July and October.

10th. We find some trees more apt to shoot into wood branches than others. Such trees should have their branches left long in pruning; but those shoots which are loaded with blossom buds should be shortened, that the remaining buds may nourish the fruit better.

11th. It is necessary, the first and second year after planting a tree, to prune it very short, to make it shoot into wood; and if, in following years, it does not come into bearing, but keeps shooting unprofitable wood, as is common with the *Bergamotte*, *Rousselet*, and *Virgoulouse pears*, and some others, then leave every shoot very long. Of all the sorts of pears, none will bear pruning so short as the Winter *Bon Crêtien;* for then it will give large wood and larger fruit.

15th. In pruning, we must have regard to soil and climate. If it be wet and cold, we must prune the tree very open; but in light, sandy grounds, where fruit is *always good*, though it is smaller, the pruning should be different. Wounds made by pruning, heal with very great difficulty, in very hot, dry land; and I have known them entirely perish by pruning.

16th. When a tree looks yellow, pluck it up and plant another. It is not worth the trouble of pruning and culture. But if it be a rare sort we may recover it by mud that has been well turned and dried, and hogs' dung laid about the roots.

If we find that pear or quince stocks do not answer a particular soil, take them up and plant those on free stocks; if they fail, plant apples; in short, suit your trees to your soil, otherwise all your labour is lost.

17th. Pear trees, in their soil, should be planted shallow, that the roots may spread; fern or straw is a great protection in summer to the roots, and vastly encourages their growth.—

People fond of raising fruit, should keep free stocks ready to engraft, but never use suckers, they are good for nothing.

22d. When we graft a young or old tree, we should do it as nearly equal on each side as possible, otherwise that which is not engrafted will run away with the nourishment from the grafts. This is of less consequence in budding, as this does not affect the tree so much When trees are transplanted, the holes should be made as large as possible, and the ends of the roots cut away, and *the small fibres* taken off; for they are apt to rot and infect the great roots.

[An exception may be made to this last rule, where considerable earth can be taken up with the tree, and it is instantly replanted; in that case the small fibres are of great value to the tree.]—*Editors.*

24th. When you plant a wild stock for grafting, be as careful as if it was the finest fruit. This is apt to be neglected, though this stock is to be the foundation of all our work.

25th. When we transplant a tree, never fail to plant the same side towards the south which stood so before. We must also defend, as much as possible, the wound made by grafting from the violence of the sun.

[If this be an important rule in Great Britain, it must be more so here. Grafts should be loosely covered till the whole wound is healed.]—*Editors.*

26th. In dry, sandy ground, plant trees in autumn, and in moist, watery places, in spring, otherwise the winter is apt to chill and kill them.

Apples and pears, though more hardy than some others, are still more apt to be hurt by water standing round them.

In moist grounds, it is good to open the holes in the fall, and let them remain open all winter; this enriches and mellows the land thrown out, and fits it better for planting.

Where a soil is light and sandy and not subject to inundation, plant the trees in the beginning of November and they will gain fibres enough to support them before winter, and will shoot well the next spring, and better than those planted in the spring.

[N. B.—In this country we should plant in October.]

27th. I have remarked, in the way of grafting, a curiosity which, it is likely, may be new to many cultivators. If we have a good bearing tree which runs so much to blossom that the shoots

and fruit are small; if we take from the bearing shoots of such a tree a few buds and inoculate them upon large vigorous shoots of some other pear tree, such buds will bear the second year and produce very large fruit, having plenty of sap to nourish it; or if we put buds of the less bearing kinds upon good bearers, such buds will be so far overruled by the nature of the bearing tree as to bring abundance of fruit; but on either of these occasions, it is necessary to assort our fruits, and to inoculate only summer pears upon some of the pear trees of the same season. Autumn pears should be inoculated upon autumn pears, &c. &c. but never graft or bud a winter pear on a summer one, for the sap of the summer pear will decline or diminish before the winter fruit is sufficiently grown.

Analysis or Examination of the present state of Agriculture in Massachusetts, so far as the same can be ascertained by the answers of several highly respectable Gentlemen, in various parts of the State.

BY THE CORRESPONDING SECRETARY.

About fifteen years since, the Trustees of the Massachusetts Society for Promoting Agriculture, framed and published a set of queries addressed to the farmers and cultivators of this state, requesting information on almost every interesting subject of agriculture.

Although some gentlemen have treated their application with great respect, and have very faithfully performed the duty requested of them, yet the queries have not been so generally and extensively noticed and answered, as to enable the Trustees to ascertain the general mode of culture throughout the state. Doubtless the principal object of the gentlemen, who then composed the Board of Agriculture, in sending forth these queries, was to enable them to make a correct analysis of the actual progress and state of agricultural science in Massachusetts; to ascertain its defects as well as its advantages; to compare the processes and crops of one part of the Commonwealth, with those of another; and to contrast the whole with the proceedings and products of other countries.

This project of our predecessors was wise, and had it universally met with the encouragement it merited, it would have formed the basis of intelligent remark, and useful discovery.

In the papers of the Society printed in 1807, there was an analysis of the various answers, which had, at that time, been returned. They were those which had been received from Mr. Heath and Col. Gardner, of Brookline; from the Rev. Mr. Packard, of Marlborough; from the Rev. Mr. Mellen, then of Barnstable; from Dr. W. Payne, of Worcester; from Mr. Joseph Kent, of Newbury; from Mr. Thos. Hubbard, of Concord; from Col. Parsons, of New-Gloucester; from Dr. Babbit, of Brookfield, in behalf of the Agricultural Society in Worcester County; and from the Western Society of Middlesex Husbandmen.

This analysis will be found to be interesting, and to furnish a very good view of the then state of agriculture in the counties referred to.

Since that period we have from time to time published some further replies, to wit: From the Hon. Justin Ely, Esq. West Springfield; from the Shrewsbury United Agricultural Society; from the Newbury Agricultural Society; the Agricultural Society in Vassalborough; and the Danvers Agricultural Society.

It is earnestly to be wished, that other intelligent farmers, in other parts of the state, would imitate these praiseworthy examples. We should then be able to ascertain not only the difference of culture in different sections of this Commonwealth, but what has been the progress of this art during the last ten years. It may be both useful and entertaining to exhibit an analysis of the five last mentioned replies, arranged under different heads, to which may be occasionally added a few remarks on the culture of the same articles in Great Britain.

I. SIZE AND DIVISION OF FARMS.

Mr. Ely states the size of farms in the vicinity of West-Springfield, to be from twenty to eighty acres, and to be divided as follows: one sixth pasturage, mowing and tillage one third, and the other half wood and orcharding.

The Shrewsbury Agricultural Society state the size of farms to be about one hundred acres, and to be divided one third into mowing, one third pasturing, one ninth tillage, and two ninths woodland.

The Newbury Agricultural Society state the size of farms to be about seventy-five acres, divided into one seventh orchard and woodland, and the remainder—two fifths mowing and tillage, three fifths pasture.

The Vassalborough Society state the farms to consist of about one hundred acres, one fourth wild, as much growing up to young wood, twenty acres of pasture, twenty of mowing, six of tillage, and two of orcharding.

The Danvers Society state the farms to run from forty to one hundred acres, and to average seventy-five acres. *There are many who follow gardening* who have from *five to twenty acres.* The Danvers farms are divided into mowing, tillage and orcharding about one third, pasturage one half, and woodland one sixth.

In Great Britain, the average size of farms, according to Arthur Young, is about three hundred acres, and they are divided into one half tillage, and the other half grazing, including pasture and mowing.

It is natural here to inquire, why so much larger a portion of the farms in Great Britain is employed in tillage? Is it that the British farmers understand their interest less than ours? Can the spirited and active cultivation of land be more profitable there than with us? As the average size of their farms is three times as great as ours, one would suppose, that the proportion of tillage to other lands would be greater with us than with them. Is it owing to the difference between the two countries in the price of labour, and of cattle? That difference was formerly much greater than at present. The average price of men's labour in Great Britain is now about sixty-seven cents per day, and ours does not exceed, probably, seventy-five cents, taken as an average for the State. To balance this, may be placed the extra price of rents in England. The farmer is seldom, there, the owner of the soil, and he pays a rent of from five to thirty dollars per acre; his taxes also are at least three times as great as those paid by our farmers.

Both these items are to be deducted from the profits of the British farmer. The price of the cattle employed in labour, and also of agricultural implements is rather higher in England, than in Massachusetts. How then is this secret explained, that a British farmer can afford to employ half his land in till-

age, while we employ from a sixth to a sixteenth only? Is the cause to be sought in the higher price of the produce of farms in England? Certainly not; the price of the products of our farms is higher, and has been so for many years (excepting this year of uncommon scarcity in Great Britain) than it is there. The only solutions which we can find for this paradox are the following: the greater capital employed by the British farmer, a superiour spirit of enterprize, and the convenience of more ready markets. But is it clear, that our farmers could not extend their tillage to advantage? How can they ever accumulate capital, if they limit their labour to the raising barely enough to keep their cattle through the year, and to the disposal of a surplus barely sufficient to pay their taxes, and supply them with a few foreign commodities? Are there not some radical defects in our system? Is there not a want of enterprize? We know we speak much of our spirit of adventure, and it may truly be affirmed, that our merchants are the most enterprising on earth; but is this true of our farmers? We suspect the very reverse to be the fact. We believe that until within a few years, little effort has been made to improve our system. If twenty years ago it had been asked, whether we could rival the Gloucester and Cheshire farmers in the article of cheese, we should have been told, that we did not possess the fertile lands of the vale of Gloucester; yet we have lived to see the time in which the cheeses of this State, New Hampshire and Rhode Island, after being ripened by a voyage, would rival in the British market the very choicest products of these most favoured parts of Great Britain.

May not the same change take place in other branches of culture? May we not hope to see indian corn, the most expensive and exhausting as well as uncertain of our crops, less favoured, and the finer grains, and many valuable roots, absolutely unknown as general productions, cultivated with the same success that they are in Europe? When we shall find that we can raise with ease 400 bushels of potatoes, or as many carrots, on an acre, by spirited culture, and that they will support in better condition our cattle and horses, than the ordinary produce of three acres of neglected mowing land—that we can by these means not only increase the stock on our farms, but greatly improve it—we have little doubt, that such a revolution in

their husbandry will be favoured by our farmers. Now these things are practicable in our country. How many years did Massachusetts labour under the absurd opinion, that the plaister of Paris, though well suited to Pennsylvania, was utterly useless to her? How long did she contrive to be the Issachar of the middle states, and bear the burden of that valuable fossil manure to enrich their grounds, and to be returned to us in the form of flour, for which we have always been tributary to them? And even after our more intelligent farmers on Connecticut river discovered that the fertilizing powers of plaister of Paris were not limited by a geographical line, how long did we continue to believe on the faith of "Nobody knew who," that the vicinity of the sea-coast rendered that manure useless and inert, which spread fertility and plenty every where else. Yet it is now established, beyond all reasonable doubt, that the gypsum or plaister is highly useful, if not as universally so, on the seaboard, as in the interiour.

As to wheat, the matter is placed beyond a doubt, that with the same care as is bestowed in England and in the middle states, we can raise the first and noblest of grains on the very margin of the ocean, as well, nay we can produce better crops, than are ordinarily gathered in the favoured states. We are aware that we have been drawn rather aside of our subject, by the interesting nature of these questions, and we shall now resume our analysis.

II. PREPARATION, TREATMENT AND AMOUNT OF GRAIN CROPS.

HERE we find considerable variety of treatment, and success, stated in the replies under consideration. Mr. Ely, of West-Springfield, says the land for indian corn is ploughed but once—does not state whether it is hoed twice or three times—crop from fifteen to forty bushels. Rye on high lands is ploughed or hoed in after indian corn—crop from five to fifteen bushels. Common wheat is raised, either on new lands—crop from twelve to twenty bushels—or else Virginia wheat (which is we suppose a spring wheat) is raised on old manured lands, or on new turned sward land, ploughed and harrowed twice, and yields from fifteen to thirty bushels. It would seem from this statement, that the wheat culture was much the most profitable, the labour not exceeding half that of corn; and the produce of corn, put-

ting indian corn at half the price of wheat, not equalling that of wheat.

The Shrewsbury Agricultural Society state, that old rye fields are ploughed twice, harrowed across the furrows, sown, and then harrowed again. Oats, barley and spring wheat are usually sown on lands where corn was grown the year before. The land is not ploughed the year before, after the corn is off, only once ploughed in April, harrowed, the grain sown, and ploughed in with an horse plough, and if grass seed is sown, it is smoothed again with a brush harrow. They remark, that spring wheat should be got in as early as possible, say in March. No manure is applied with the smaller grains. For indian corn the ground is ploughed in June, or in August for the next year, and in the spring cross ploughed and sometimes harrowed. A horse plough is then used, to mark out the rows, and then it is dunged, seeded and covered as usual. The quantity of rye on an acre, they state to average fifteen bushels, oats thirty-five, barley eighteen, wheat twelve, and corn thirty-five.

We remark here, that the cultivation of corn in this part of the state, seems to be much the most spirited, and to exceed that of their neighbours on Connecticut river. They plough the year before, they cross plough, and sometimes even harrow for indian corn. This is doing well; but they are less attentive to the finer grains. Let them try their three ploughings or two ploughings and harrowing for spring wheat, and they will soon find their average rise to sixteen or twenty bushels, and the value of the crop exceed that of their indian corn.

In Newbury (say their society) we plough twice, manure for planting with from ten to thirty loads per acre. They sow two bushels of wheat, three of barley, and one of rye to the acre. An average crop of corn is *forty* bushels, potatoes two hundred, barley thirty, rye fifteen, wheat sixteen to twenty.

This looks well; it shews the advantages of frequent ploughing and ample manure. If others say they cannot get the manure, we answer, farmers can always get manure, if they will get the crops; and they will get the crops if they will plough twice, or as in England, three, four and five times. This will supply the place of dung till they get large crops, and these crops will enable them to obtain manure. We see they adopt the practice of pretty liberal seeding in Newbury; yet in the

English and French husbandry, they sow more. Three bushels of wheat on land no better prepared and no richer than ours, they would think full little seed to an acre. Spring wheat should be sown thicker than fall wheat; it has not so much time to spread, and of course requires more seed.

The Vassalborough statement on this point is too general to enable us to give their processes. In planting indian corn they plough in the fall; they put on gypsum or plaister after it is up, usually hoe twice, sometimes once only on new land, crop from thirty to forty bushels.

The Danvers Society state, for corn they plough once and harrow thoroughly, crop from twenty-five to forty bushels. For barley, land is twice ploughed and harrowed once. Two bushels of seed are used, and crop of barley twenty bushels.

Such is the view given of our treatment, and the produce of grain crops in some of the best districts of Massachusetts. It is apparent from even this short sketch, that nothing but more labour and manure is necessary to secure us good crops, as good or better than those of other countries. It is apparent that indian corn is the favourite production; for that alone the ground is sometimes ploughed twice, for that, we submit to the labour of dunging and planting in holes, for that, we go through the labour of three hoeings and ploughings while it is growing. As to the expense of the culture of indian corn, there is an unaccountable difference in the opinions of our correspondents. Mr. Ely estimates the labour of an acre of indian corn at from six to nine days labour of one man, and shelling its produce two days and an half. The Shrewsbury Society estimates the same labour at eighteen days, &c. The Newbury Society, at from twenty-seven to thirty-two days. The Vassalborough Society, at nineteen days. The Danvers Society, at from eighteen to twenty-one.

Between the two extremes, that of Mr. Ely eleven days, and the Newbury Society thirty-two, the difference is so great as to lead one to apprehend, either that the process was much more thoroughly performed by the latter, or that the former had found some mode of shortening labour unknown to the latter. But be this as it may, we must take eighteen days labour of a man at least, as the average amount bestowed on an acre of indian corn. It would not be deemed extravagant to say, that this is

double the labour required for an acre of wheat. Why then does it happen, that indian corn continues to be so great a favourite to the exclusion of wheat? If it be said that it is more profitable, why do the farmers of the wheat raising states so much surpass ours in opulence? Will it be said that corn is more natural to our country? Corn requires the best of land, the richest culture, the most favourable seasons. The climate of Virginia, of Maryland and Pennsylvania is better calculated for corn than ours; yet they raise wheat in preference. We failed formerly it is true; the wheat crop was uncertain; it was subject to blight. But this is equally the case at times in Great Britain, in Canada and in France.

"The climate of Great Britain," says a great practical farmer of that nation, "has of late years been very unfavourable to the growth of wheat. The distempers to which wheat has for *many* seasons past been subject, are called blight and mildew." He says this is owing to the kind of wheat they use, and recommends a spring or summer wheat, which is seldom or never subject to these diseases. He says the average crops of wheat in Devonshire (a county from which a great proportion of our ancestors came) is about fifteen bushels, and the produce of this new summer wheat from twenty-five to thirty bushels.

If our farmers will only give themselves the trouble to look over the accounts of late experiments on spring wheat, even on the sea-board in Massachusetts, where it is supposed to be the most subject to blight, they will find the average produce to exceed twenty bushels. In this present number of the Repository, they will see the experiments of Mr. Parsons, of Brighton, who raised about thirty-seven bushels of excellent wheat on an acre, and Mr. Lowell, who on very indifferent light land, raised twenty-two bushels to the acre of wheat of a superiour quality.

Is it not unaccountable then, that our farmers should persevere in raising an expensive, exhausting plant, in preference to another of more easy cultivation, of as certain a produce, and more profitable? The true secret of blight or mildew in wheat, in this state, in former days, was slovenly cultivation. Let the land be well prepared the fall before by two ploughings, let it have a ploughing and cross ploughing in the spring, let it be in good heart before the wheat is attempted to be raised, let the seed be properly washed and limed, let it be well plaistered af-

ter it is up, and we believe there will be less frequently a failure of the wheat crop than of indian corn. In place of some further remarks, which we had proposed to make on this subject, we insert the following letter, just received from Gen. Dearborn, to the Corresponding Secretary, which is extremely apposite and very forcible on this point.

Brinley Place, January 25, 1817.

DEAR SIR,

I HEREWITH send you a copy of the letter required.

As I know you take great interest in our domestic improvements, I send you a paper containing a letter from De Caritat, to the President of the New-York Society for the Encouragement of Manufactures, presuming you may not have seen it. I do this, because the fact which I stated in my letter to you, that *woad was indispensably necessary for making a permanent blue die, is confirmed* by an experienced dier from Switzerland.

The indigenous substitute which he says he has discovered in this country, cannot be so easily or abundantly raised as the woad, for milk-weed requires a peculiar soil.

Perhaps it may be well to put an extract of that communication into your agricultural publication, by way of a note, confirmatory of the statement contained in my letter, as to the importance of woad to ferment the indigo vat. It is so difficult to induce our agriculturists and mechanics to make experiments, that nothing should be omitted which may tend to convince them of the truth of whatever may be of private or public benefit.

It is a lamentable and notorious fact, that a too general belief prevails, that nothing useful can be learned from *books*, in relation to agriculture or manufactures. This prejudice being once removed, we shall soon equal those nations who now so much excel us.

England has made most rapid improvements in agriculture since the establishment of the numerous agricultural societies, which are now scattered over that kingdom. We must do the

same. It is up-hill work; but I trust the spirit of our best citizens will clear the way and pursue the object with patriotic zeal.

Our farmers have not advanced in any degree in proportion, either to their natural intelligence or the progress of the arts in other countries. They plant indian corn to their ruin; their orchards are as neglected as their woodlands; and after you get at a distance from considerable towns, *horticulture* is scarcely known. New-England can furnish bread stuff for the whole of the United States, and is still dependant on the southern states for flour.

The states of Pennsylvania, Maryland, and Virginia do not yield, on an average, more than eight bushels of wheat to the acre; and no part of New-England yields much less than twenty, and from that to forty.

I rode over a part of the District of Maine, New-Hampshire, Vermont, and this State, last summer, and I presume there was twice as much wheat raised as in any other year. Notwithstanding the season, the crops were never better, while the *corn* was generally destroyed. Our farmers never will grow rich until they abandon planting *Indian corn;* it is ruinous to their prosperity. Wheat, rye, and barley are raised with more ease, are more certain, and nearly twice as valuable. Our ancestors found the *natives living on Indian corn*, and we do the same. I cannot discover any other reason why such a practice should prevail. The northern nations of Europe never raise *Indian corn.* Wheat is an article of export even from the Baltic and Black sea, and still we cannot shake off this fatal predilection for *corn.*

I have about two bushels of woad seed which I shall be glad to give to any person who may wish to make an experiment. Should application be made to your society for seed, please to require it of me.

With great respect,

Your obedient servant,

H. A. S. DEARBORN.

JOHN LOWELL, Esq.

Pastel, or Woad, important to our Farmers as a product, and to our Manufacturers as a substitute for Indigo.

The public are indebted to General H. A. S. Dearborn, of Roxbury, not only for the translation of an admirable treatise of C. P. De Lasteyrie, on the culture, preparation, history, and analysis of Woad, but amidst his numerous public avocations, for his spirited and judicious experiments upon its culture, and the process of obtaining a pigment from it.

The Trustees of the Massachusetts Society for Promoting Agriculture, in submitting his letter to the public, tender him their respectful acknowledgments for his interesting communication. They assure the public that they have a specimen of the pigment obtained by General Dearborn, very nearly resembling, in colour and all its sensible properties, the most perfect Indigo. General Dearborn, in the true spirit of a patriotic citizen, also authorizes them to assure the public, that he has two bushels of Woad seed ready to be given to any person who may be disposed to cultivate it. The work translated by General Dearborn may be had gratis by the Agricultural Societies throughout this state, by applying to J. Lowell, Corresponding Secretary of the Massachusetts Agricultural Society; General Dearborn having presented certain copies for this end.

Before we insert General Dearborn's letter, we would observe that a French gentleman of science, Monsieur De Caritat, has recently, in a letter to the New-York society for the encouragement of manufactures, thus noticed and confirmed the opinions of General Dearborn. Speaking of a Mr. Treytorrens, a dier of Switzerland, he says:

"Through the kindness and zeal of Dr. Mitchell and Mr. James Robertson, with whom I have made him (Mr. Treytorrens) acquainted, he had knowledge of a work just published in Boston, and sent by the translator, Mr. H. A. S. Dearborn, to the former gentleman. When he had ran it over and examined it, he came again to me, wishing I should state to you his observations and discoveries, either relative to the subject, or some other branches of his profession, tending to shew his devotedness to his adopted country, and particularly its manufactures.

"The following are nearly his words:—'Pastel or Woad, on which a treatise has just been published in Boston, is well known and familiar to Mr. Treytorrens, not as having cultivated it himself, which however he often saw and observed in the soil, n[illegible]manufactured, though acquainted with the process; but as having employed its product for dying. Its quality, and its *indispensible use* with indigo to obtain a deep, rich and superfine blue colour will be the sole end of his remarks now. Without Pastel or Woad, or a substitute perfectly analogous, according to him, there is no possibility of dying in deep unchangeable blue, (let the materials be what they will,) of a superiour quality. As this plant is not indigenous to the United States, and has been in Europe considered by the learned among many of a similar nature, *as deserving the preference*, the treatise concerning it, and especially the success of the experiments made here, for cultivating the same, must of course be regarded *as most precious and valuable acquisitions*.'" Mr. Treytorrens then goes on to speak of a substitute for Pastel, but which he does not pretend to say is better, and which he calls Milk-weed, or Silk-grass. What this plant is, or what part of it is used, does not appear. It will not, we are persuaded, supersede the valuable plant described in the following letter.

Brinley-Place, (near Boston) Oct. 28, 1816.

SIR,

As a citizen of Massachusetts, I feel great solicitude in every thing which may contribute to render the products of her soil of importance to the nation, and render the labours of the Agriculturist profitable.

As the society of this Commonwealth for the encouragement of those objects, have recommended experiments and invited communications on all subjects interesting to the farmer, I herewith transmit a number of copies of a work, which I have translated from the French, on the culture of Woad or Pastel, and the use of its blue pigment in dying.

Desirous of testing the correctness of the experiments which are therein detailed, of the best methods of cultivating Pastel, and extracting the indigo from the matured leaves of the plant,

I sowed a piece of ground early in May, in drills, three feet apart, and at the first weeding thinned out the plants, so as to leave them six inches apart.

On the 15th of August, I cut a part of the leaves, which covered $\frac{1}{60}$ part of an acre, and pursued the process contained in the *Information upon the Art of extracting Indigo from the leaves of Pastel*, published by order of His Excellency Montalivet, Count of the empire and Minister of the interiour; contained in the treatises transmitted. The experiment succeeded to admiration, and I herewith send you a sample of the Indigo obtained.

The fermentation was perfect at the expiration of 48 hours. The liquor being drawn off from the vats, one bucket of lime water, prepared agreeably to the directions contained in the treatise, was added to two of the liquor, and then agitated with a small wooden rake, for fifteen minutes, when a most copious white froth arose to the surface, which soon assumed a bright blue colour. This froth was carefully skimmed off and put into earthen bowls to dry, and gave me a quantity of "*fleuree*," as mentioned at page 138; a part of which I send you.

The green flocculi were deposited in two hours. The superincumbent yellow liquor being drawn off, an ounce of sulphuric acid, diluted with water, to every bucket of the liquor, was poured into the green precipitate, which instantly changed it to a most beautiful cerulean blue: cold water was then poured into this admixture and violently agitated for ten minutes.

Twelve hours after, the liquor was drawn off, and the blue deposition put into cloth filters to drain. In twenty-four hours, the indigo was perfectly drained, taken out, and put into a box with a linen bottom, which was placed in an airy situation, under cover. At the expiration of seventeen days, it had become a tenacious paste; was then taken out with a wooden knife, and pressed into small boxes to dry. In two weeks the indigo was perfectly dry.

At the expiration of twenty days, the plants which had been cut, were grown sufficiently large to cut again; which would give, of course, three cuttings a year, in this northern climate; but if sown in September, there might be four, if not five cuttings, a year. As the plants are not injured by the frosts of winter, they would, in this way, be fit to cut in June.

From this experiment, I am satisfied the following quantity of indigo could be made from an acre of ground. One cutting from $\frac{1}{60}$ of an acre gave, of indigo, half a pound. One cutting from one acre, therefore, would have given thirty pounds—four cuttings one hundred and twenty pounds. The present price of indigo is two dollars per pound; therefore, one acre of land, cultivated with Pastel, would produce to the farmer, two hundred and forty dollars.

I wish you to distribute some of the books I have sent, among the different agricultural societies in this state, and the remainder in such manner as will best tend to diffuse a knowledge of the advantages which the agriculturists and diers of this state may derive from the cultivation and use of Pastel.

If the present pacific state of the world is adverse to the extension of the cultivation and use of Pastel, as a dying material, it is nevertheless important, that the advantages which the different sections of our country may reap, at some future period, from this plant, should be known, when less favourable circumstances shall combine, to deprive us of the colouring ingredients, now so easily obtained, from every part of the globe.

During the war, indigo was four dollars a pound in New-England and New-York.

It is of the first consequence to a nation, that it can, at all times, be able to rely on the resources of its soil and industry, for, not only the necessaries, but the luxuries of life.

The resources of the United States are as yet, very imperfectly developed, but the rapid advances, which are now making in chemistry, mineralogy, botany, agriculture, and the mechanic and fine arts, warrant the most favourable anticipations of the future glory, prosperity, happiness and real independence of the republic.

Besides the advantages resulting from the cultivation of woad, as a pigment for dying, it is indispensably necessary for fermenting the *indigo vat*. For this purpose, the green leaves are used, or they are made into cakes, balls or *pelotes*, as described in the treatise.

It is a notorious fact, among well taught, scientific and experienced diers, that a deep, permanent, and brilliant blue cannot be produced, unless the *indigo vat* is fermented with woad. It has long been used in France, Germany and Holland, in

preparing the *indigo vats* in the best manufactories of those countries, and is now used in England; for it is found impossible to imitate the justly celebrated NAVAL BLUES of France without it. A more perfect fermentation is thereby produced, and the particles of indigo consequently more uniformly held in solution. The colouring pigment, prepared in this manner, attaches itself so firmly to the fabrics, that cloths thus died appear of a deep uniform and beautiful blue; the colour does not rub off, and never fades by exposure to wet, heat or the air, but remains permanent and unchanged.

There is no art less perfectly understood in this country, than dying; and it has been owing exclusively to the exertions of the first chemists of Europe, that it has been reduced to a perfect system, and the whole process conducted on known established principles.

Formerly there was a mysteriousness in the process, which for a long time excluded all attempts at investigation. Those who practised the art, made it a point to keep, as important secrets, whatever they knew, and, like the manufacturers of glass, suffered no inspection of their labours, lest they should be robbed of an imaginary treasure. There were no means within their power of detecting the causes of failure in the preparation of their vats, for they were ignorant of the chemical effects of the different ingredients used. They merely knew from practice, or tradition, that a certain combination of materials made a red, blue, yellow or green die, and if from an injudicious admixture the anticipated result did not take place, they merely said *they had "bad luck."*

Long custom had created prejudices, which forbade instruction, and, like many individuals of every mechanic art, the diers laid it down as an axiom, that nothing useful could be learned from books, or instruction communicated by individuals, who had not served an apprenticeship, and laboured in the same vocation.

The vast strides which have been made in knowledge during the last fifty years, have not been confined to the schools of the literati, or only known to the secluded philosopher.

Useful discoveries in the arts, instead of merely giving eclat to the laborious investigator and patient experimentalist, have been extensively disseminated.

The perfection of European manufactories is attributed to chemical investigation.

The superiour manufactories of painters' colours, earthen ware, and porcelain, soap, medicinal preparations, the working of metals, the art of dying and distilling, and the astonishing improvements in agriculture, are some of the important effects, which have resulted from the chemical pursuits of the learned individuals, societies and academies of the last half century.

Although the United States have progressed in civilization and the arts, in a manner unparalleled in the annals of nations, still much remains for inquiry; and it is the duty of every citizen to contribute, by every means within his power, whatever may tend to advance the best interests of all classes of society, and render our nation industrious, learned, independent and happy.

With great respect,

Your obedient servant,

H. A. S. DEARBORN.

LETTER FROM E. W. WOODWARD, ESQ.

[To the President of the Society.]

Haverhill, (N. H.) Dec. 11th, 1816.

DEAR SIR,

WHEN you were in this part of the country, five or six years since, you left with Stephen P. Webster, Esq. a sample of rye of the growth of France, with a view to experiments in this part of the country.

Mr. Webster made a distribution of it among some of his friends, with directions to have it put in the ground in the fall of the year, agreeably to instructions, which, he said, you gave him.

It fell to my lot to receive three kernels of this grain, but it wholly escaped my mind until the ensuing winter, when, on inquiry, I found others had followed the directions, and put their seed in the ground.

On the opening of the spring, I concluded to plant it, with but little expectation that it would come to maturity, and accordingly selected the first bare spot, and put in the seed.

At the time I made my garden in the month of May, finding each kernel had sprouted, I transplanted it to a more favourable spot, and was gratified in noticing its rapid growth, and finally becoming perfectly ripe, yielding that season about a table spoonful.

The season was unpropitious to all others who made the experiment, which led me to the conclusion that it was a spring grain. I accordingly so treated it the succeeding years, though by an unfortunate circumstance, (a horse getting into my garden) I lost nearly all of my second years growth; I however was enabled to save about as much as I put into the ground, thereby losing about one years growth.

In May 1815, I was enabled to plant about half a pint of seed, which I drilled in my garden, but soon found it stood too thick; it however gave me ten quarts of fair full berried rye.

Concluding this spring to give a fair experiment, and also being desirous of making as much as possible of my seed, I prepared half an acre of ground with hoes and rakes, and again drilled it in rows about twelve or fourteen inches apart, with the kernels from two to three inches apart in the rows, and cleared it twice from weeds. It has been very productive this season, having yielded, from eight quarts (the exact quantity put in the ground,) thirteen bushels and twelve quarts—one bushel of which weighs fifty-seven pounds. I have now a desire to do something with it that may benefit my country, as I am well convinced it will prove a valuable article, and one that is well adapted to our climate.

I was informed that a quantity of the same kind of seed was sent to Northampton, (Mass.) but that it was all lost by sowing in the fall; and am led to believe it has, in no other instance, been preserved.

Many applications have been made for small quantities; and there would be no difficulty in getting off the whole, to receive half the next years crop in exchange.

Your obedient servant,

E. W. WOODWARD.

FARMER'S PROFITS.

[Middleton's Middlesex.—London, 1798.]

THE accounts of particular families, produced to me, have demonstrated a profit of 32 per cent. per annum, on the sum employed, for thirty-five years in succession. Indeed it seems to be evident, that a man who employs only 500*l.* and with it brings up a large family, and places them in a situation equal to his own, while he himself retires with an easy fortune, could not have done it with a less return.

MANURE, AS APPLIED TO DIFFERENT SOILS.

[From Marshall's Minutes of Agriculture.]

DURING the drought of summer, *clayey soils* are divided by innumerable fissures; and if the manure be laid on while the soil is in this state, the first shower of rain carries down the dissoluble particles into the vegetative stratum. But, in winter, a retentive soil resembles a spunge filled with water; and the manure laid on, while it remains in this state, must either be washed away by heavy rains, or be lodged near the surface; and cannot possibly penetrate the soil until it be made porous by the ensuing summer's drought. On the contrary, an *absorbent* soil is always open to superficial moisture: it resembles a dry spunge, which greedily absorbs the moisture it can reach: and as fast as the manure laid on such a soil is liquefied, it is received by the mould. The danger here, perhaps, lies in its being hurried *through* the vegetative stratum. Is not winter then the fittest time for feeding such a soil, when the current of absorption is gentlest, rather than summer, when its rapidity may hurry down the vegetative food, and prevent its being incorporated with the plant-feeding mould? And is it not obviously eligible, on such a soil, to lay the manure on the *surface*, at the greatest distance from that depth at which it becomes useless, rather than to bury it in the soil, where it may more readily escape below the sphere of vegetation?

The writer is, *at present*, so fully satisfied with the former part, at least, of this theory, that he is determined not to manure in future the surface of a retentive soil, when its pores are full: he will either embrace the opportunity when dry weather has rendered it absorbent, or bury the manure in the soil; in which situation it may meliorate, not only, *perhaps*, as a food, but also as a provocative.

FROM BANNISTER'S CURSORY OBSERVATIONS ON HUSBANDRY.

EVERY farmer should bend his thoughts towards the improvement of his *low meadows*, and not suffer them to languish for want of a little care as beneath his attention, whilst no expense is spared in the management of tillage of his arable land, though incapable of producing so ample a profit.

The natural situation of these grounds, and their tendency to humidity, point out the first method to be pursued for their improvement, which is draining. For t is purpose a principal ditch is to be made on the lowest ground, and a number of smaller ones are to intersect the meadow, pointing to the principal drain. But if, as frequently happens, the meadow should lie lower than a neighbouring river, so that the water cannot be conveyed directly to that reservoir; or if it lies at some distance from the river, still the method of cutting drains should not be omitted. These drains may point to a ditch that ought to surround every piece of land of this description, or to a pond, which may be sunk in the lowest part of the field, to receive the contents of the drains, which should always be kept clear, for the water to flow away.

The meadows being thus drained, will by degrees produce grass of a finer texture, and abate of their tendency to send forth rushes and flag grass. But to improve these meadows still farther and to rid them of these inconveniencies, it will be necessary to cover the surface yearly with a good dressing of town mud, road grit, ashes, or soot, thinly spread; and on the lowest parts, gravel may be thrown with great advantage. These will be found to destroy the rushes, &c. and contribute to bring the meadows into a good state.

Various are the benefits to a farmer who unites much of this low ground with his ploughed land. When properly managed, the hay cut from meadows will be found equal in quality, and more abundant than that from uplands; and every sort of stock (sheep excepted) will be provided with a pasture much more salubrious and congenial to them.

ACCOUNT OF THE CATTLE SHOW AT BRIGHTON.

IN OCTOBER, 1816.

THIS exhibition was attended by a most numerous body of respectable farmers and distinguished citizens. In one point, that of *fat* cattle, it was rather meagre; in all other respects we should have been well satisfied to have placed it down at Smithfield or Lewes, at Bath, or at Mr. Coke's sheep shearing, at Holkham. It would not have disgraced our country in the estimation of any foreign farmers.

Three causes operated against the production of a greater number of fat cattle. The unexpected season which almost threatened famine, the novelty of the exhibition, not yet extensively known, and a general but unhappy opinion that the great Springfield Oxen would both be sent, and would of course distance all competition, carrying the only two prizes for that description of cattle.

Nineteen different competitors offered for exhibition: (we do not mean this for the number of animals, for there were nearly an hundred; but the number of claimants.)

The Merino Sheep were uncommonly fine, whether regard be had to the purity of blood, the form and condition of the animal, or the fineness and quantity of fleece. The adjudication must have been embarrassing to the Judges. We presume that the size and quantity of fleece turned the scale in favour of Mr. Ingersoll of Brookline, for the first premium, and of Mr. Jaques for the second; Mr. Bussey's were also very fine sheep, as were the selections from the excellent and extensive flocks of Mr. Parsons and Mr. Prince, which were not in competition. (These gentlemen declined to stand for the premium, on account of their offices in the Society.)

The three year old bull owned by Mr. Thomas Gardner of Groton, which carried the first premium, was a noble animal of most perfect proportions.

The bull of Hon. Judge Dana of Groton, which obtained the second premium, was a wonderful animal for his age, being only nineteen months old; his size exceeded that of most two and of many three year old bulls, and his figure was very fine.

The milch cow which carried the first premium, was owned by Mr. Caleb Oakes of Danvers; and if this article should reach all parts of the United States and Great Britain, we think we may challenge the whole to furnish her superiour. Her calf was weaned last May. During the last twenty weeks she has furnished milk from which 320 pounds of butter have been made!

She was milked on the field in presence of the Judges, and gave at a single mess, at the end of six months after calving, nine quarts of milk, as near as we could judge by the size of the vessel.

She is below the middle size and of beautiful proportions. The owner was offered for her on the ground one hundred dollars. At an English exhibition, such a cow would bring one hundred guineas for her wonderful properties.

The cow to which the second premium was awarded, was owned by Rev. Dr. Foster of Brighton. In quantity of milk, she equalled the other, but it did not appear that its quality was so unusually rich, though very fine. She had one property very uncommon, that of continuing to give milk the whole year, having for several years given six quarts per day before calving, without having ever given less.

The first prize for working cattle, was awarded to John Parkman, Esq. of Brighton; and the second for the same to Mr. John Warren of Brookline.

We extremely regret that the pressure of time prevented the trial of an ingenious newly invented plough. The Trustees of the Agricultural Society will certainly attend to it, but it was impossible to do it on this occasion, as there was barely time to get through the examination of the cattle.

CATTLE SHOW AND EXHIBITION OF MANUFACTURES, AT BRIGHTON,

ON THE SECOND TUESDAY OF OCTOBER, 1817.

THE Trustees of the Massachusetts Society for the promotion of Agriculture, encouraged by the renewed patronage of the Legislature of this state, intend to bestow in premiums, not only the sum granted by the government for this purpose, but also the whole amount of the income of their own funds. They therefore announce to the public their wish to have a Cattle Show, and Exhibition of Manufactures, at Brighton, on the second Tuesday of October, 1817; and they offer the following Premiums.

FOR STOCK.

For the best Bull raised in Massachusetts, of any age,	$ 40
For the next best do. do. - - - - -	25
For the best milch Cow, not exceeding eight years old,	40
For the next best do. do. - - - - -	30
For the next best do. do. - - - - -	20
For the best Ox, fitted for slaughter, and weighing not less than 1800 wt. - - - - - -	50
For the next best do. do. not less than 1500 wt. -	40
For the next best do. do. not less than 1300 wt. -	30
For the best pair of working Cattle, not exceeding eight years old, - - - - - - -	40
For the next best do. not exceeding eight years old, -	30
For the next best do. of any age, - - -	20
For the best Merino Wethers, not less than six in number,	20
For the next best do. - - do. -	10
For the best native Wethers, - - do. -	15
For the next best, - - - - - - -	10
For the best Merino Ram, not less than three years old,	20
For the next best do. of any age, - - - -	10
For the best Merino Ewes, not less than five in number, and two years old, - - - - - -	30
For the next best do. do - - -	15

For the best Boar, not exceeding two years old, - 10
For the next best do. - - - - - 5
For the best Sows, not more than four years old, and not less than two, and two in number, - - - 10
For the best Store Pigs, not less than two in number, and not more than two years old, - - - 10
For the next best do. do. do. - - - - - 5
For the best Bull hereafter imported by a citizen of Massachusetts, having regard to the adaptation of the breed for meat as well as dairy, - - - - - 100
For the next best imported do. - - - 75
For the best milch Cow, imported, - - - 75
For the next best do. - - - - 50

Any of the above stock, when raised, and still owned, at the time of exhibition, by the person who raised them, will entitle the claimant to an allowance of ten per cent. in addition.

FOR AGRICULTURAL EXPERIMENTS.

To the person who shall raise the greatest quantity of wheat on an acre, on a tract not less than one acre, specifying the nature of the soil and culture, - - - - - 40
To the person who shall raise the greatest quantity of carrots, potatoes, or turnips, having regard to the quantity of land and mode of culture, - - - - 40
To the person who shall introduce any new vegetable or grass, and prove, by cultivation, its superiority to those now in use, or its being a good substitute for them, 30

INVENTIONS.

To the person who shall invent the best, simplest and least expensive machine for thrashing wheat or any small grains, 75
To the person who shall invent the best and simplest, and least expensive machine for sowing small seeds on an extensive scale, - - - - - - - - - 30
To the person who shall invent the best plough for common purposes, - - - - - - - - - - 20
To the person who shall introduce the drill plough, and apply it successfully to the culture of any small grains or seeds, - - - - - - - - - - 20

To the person who shall produce at the show any other agricultural invention, which shall in the opinion of the Trustees, deserve a reward, - - - - - - 20

FOR DOMESTIC MANUFACTURES.

To the person or corporation who shall produce the best specimen of fine broadcloth, not less than six quarters wide, and 100 yards in quantity, from wool grown in Massachusetts, and manufactured within the same, - - 50

To the person who shall produce the best specimen of broadcloth as aforesaid, not less than 100 yards, - - - 30

To the person who shall produce the best specimen of broadcloth as aforesaid, manufactured in his family, and not less than twenty yards, - - - - - - - 20

To the person or corporation who shall produce the best specimen of cotton cloth, manufactured in this state, not less than fifty yards, - - - - - - - 20

To the person who shall produce the best specimen of any other fabrics of wool or cotton, or both, manufactured in this state, in public factories, - - - - - - 20

In private families, - - - - - - - - 20

It is understood, that whenever merely from a want of competition, any of the claimants might be considered entitled to the premium, under a literal construction, yet in the opinion of the Judges, the object, so offered, is not deserving of any reward, and is not superiour to many similar ones not offered, the Judges shall have a right to reject such claims.

Persons to whom premiums shall be awarded, may at their option, have an article of plate with suitable inscriptions in lieu of the money. Premiums will be paid within ten days after they shall be awarded. The rules and regulations of the Cattle Show will be made known some weeks before it will take place.

By order of the Trustees,

J. LOWELL, *Chairman of the Committee for Premiums.*

LIST OF MEMBERS OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

Those marked thus, (*) Deceased.

Adams John, His Excellency
*Avery John, jr. Esq.
*Ames Fisher, Hon.
*Appleton Nathaniel,
*Appleton Nathaniel W. Dr.
Andrews John, Esq.
Allen Joseph, Esq.
*Ammidon Caleb, Esq.
Adams Jonathan,
*Amory Thomas C. Esq.
Adams Benjamin, Hon.
Ammidon Calvin, Esq.
Andrews William, Maj.
Andrews Asa, Esq.
Appleton Daniel,
Ayer James, Esq.
Abbot John, Esq.
* Breck Samuel, Esq.
* Barrell Joseph, Esq.
* Brimmer Martin, Esq.
Bulfinch Charles, Esq.
* Baldwin Loammi, Esq.
* Brattle Thomas, Esq.
* Bowdoin James, Hon.
Baylies William, Dr.
* Brooks Eleazer, Hon.
Brooks John, Hon.
Bacon John, Hon.
Beals Benjamin, Esq.
* Black Moses,
Bass Samuel, Esq.
Baker Samuel, Hon.
* Bridge Ebenezer, Hon.
* Blodget Samuel, Esq.
Bates Elijah,
Boardman William, Esq.
Billings William, Esq.
* Bigelow Daniel, Esq.
Bannister Seth, Esq.
Beaman Ezra, Esq.
Bromfield Henry, Esq.
* Buckminster Joseph S. Rev.
Bartlett Bailey, Esq.
Bartlett Thomas, Esq.
Brewer Thomas,
Brewer John,
* Babbet Thomas, Dr.
* Brigham Elijah, Hon.
Bussey Benjamin, Esq.
Butler Moses, Esq.
Baldwin Luke, Esq.
Burbanks Timothy, Capt.
Brooks Peter C. Hon.
Bartlett William, Esq.
Barnard David,
Breed John,
Breed Ebenezer,
Bates George, Dr.
Brown Michael,
Bixby Daniel,
Bachelder Joseph,
Bascom Jonathan, Esq.
Bowman Joseph,
Brown Daniel,
Bradley Enoch,
Bailey Jonathan,
Bradley Benjamin,
Bradley Caleb L.
Brown Abner,
Burnham Josiah,

* Cutler Mannasseh, Rev.
* Codman John, Esq.
* Cutts Edward, Esq.
Cabot George, Hon.
Craigie Andrew, Esq.
* Cranch Richard, Hon.
* Cary Samuel, Esq.
* Chandler Samuel,
* Cushing Thomas, Esq.
Coney Daniel, Hon.
Cutler John, Gen.
Carr Francis, Capt.
Coolidge Joseph, Esq.
Cleveland Nehemiah, Esq.
Coolidge Charles,
Coolidge Cornelius, Esq.
Cleveland William,
Corlis Ephraim,
Carlton Aaron, jr.
Carlton Daniel,
* Chadwick Samuel,
Carlton Elijah,
Currier Daniel,
Colt Samuel D.
Choate John, Esq.
Choate John P. Maj.
Choate George, Esq.
Cobb Elijah, Gen.
Crosby Oliver, Hon.
Craigie Benjamin,
Coffin Nathaniel,
Chandler Peleg, Esq.
* Dexter Samuel, Hon.
* Durfee Thomas, Hon.
Dexter Aaron, Dr.
* Dana Francis, Hon.
* Dean Samuel, Rev.
Danforth Samuel, M. D.
Davenport Seth,
* Dexter Samuel, jr.
* Denney Thomas, Col.
Davis John, Hon.
* Davis Thomas, Hon.
* Dix Elijah, Dr.
Dix Joel,
Dwight Thomas, Hon.
Derby John, Esq.
Derby E. Hersy, Esq.
Deering James, Esq.
Dowse Edward, Esq.
Dodge Robert, Capt.
Dane Nathan, Hon.
Dwight Edmund, Esq.
Dillaway Samuel,
Draper Simeon, Esq.
Duncan James, Esq.
Duncan Samuel, Esq.
Day Heman,
Davis Jonathan, Esq.
Dearborn Henry A. S. Esq.
Edwards William, Esq.
Ely Justin, Esq.
Edwards Timothy, Hon.
* Eggleston Azariah, Esq.
* Emerson William, Rev.
English Thomas,
Emery Moses,
Emerson Daniel,
Elwell Paine,
Emerson Oliver,
Emerson Billy,
Eaton David S.
Emery Robert,
* Foster Bossenger,
Foster Dwight, Hon.
* Flagg Samuel, Esq.
Frye Simon, Esq.
Fisher Joshua, Dr.
Fowler Samuel, Esq.
Fessenden Arthur,

Fiske Oliver, Hon.
Fessenden Samuel, Esq.
Freeman James, Esq.
Freeman Samuel, Esq.
Frye James,
Field Alexander,
* Gill Moses, Hon.
Gore Christopher, Hon.
* Guild Benjamin,
* Gorham Nathaniel, Hon.
* Gerry Elbridge, Hon.
Greenough David S. Esq.
Gold Thomas, Esq.
Greene Joshua, Esq.
* Gray John, Capt.
Gray William, Hon.
Gardner Samuel P. Esq.
Gardiner Robert H. Esq.
Goddard Benjamin, Esq.
Gale Moses,
Groves Rufus, Col.
Geddings Joshua, Major
Gardner Stephen P. Esq.
Goodell Asa, Esq.
Gould Elijah, Esq.
Gifford Prince, jr.
Godfry Grovenor,
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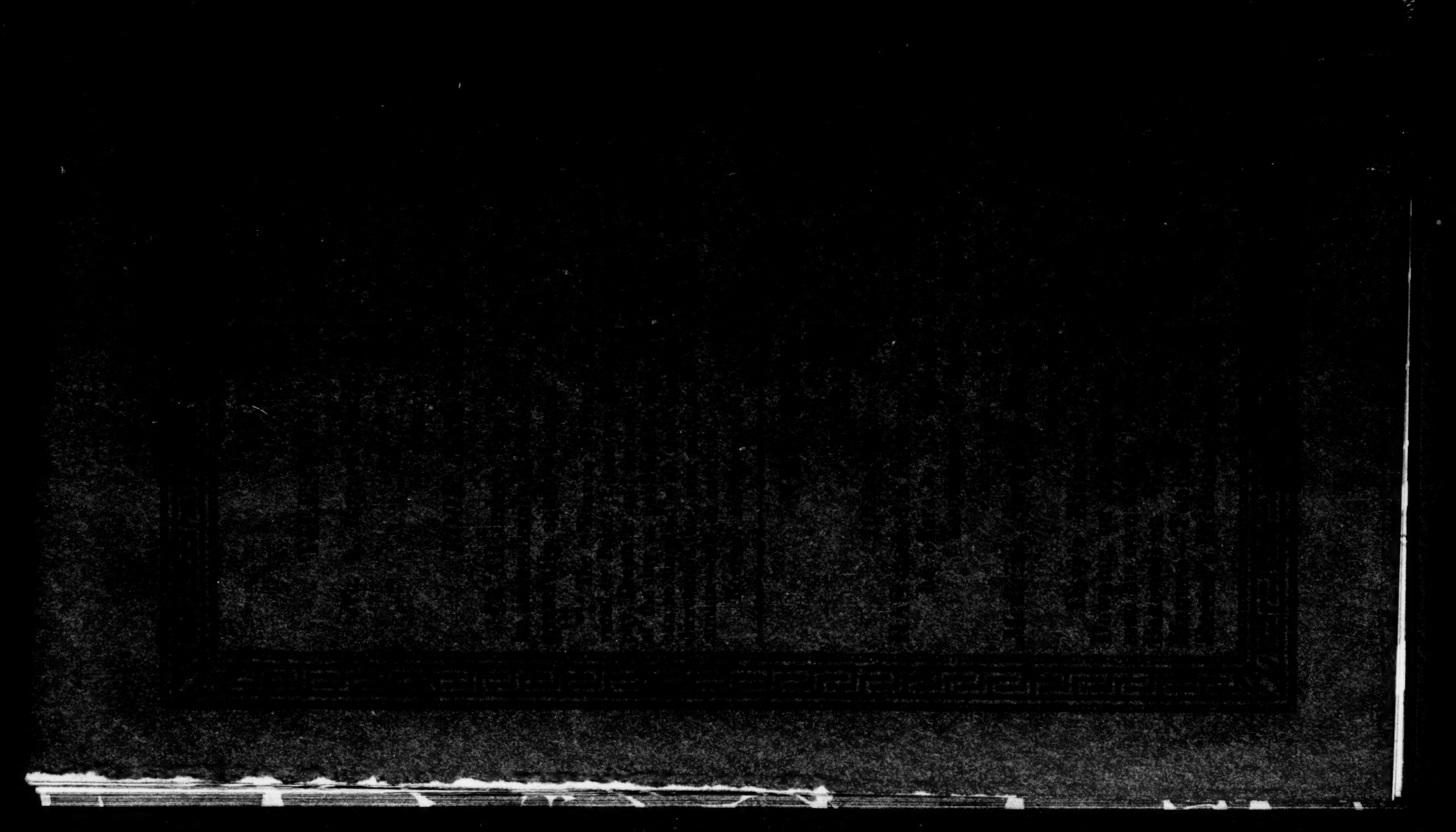

FIG....II.

FIG....I.

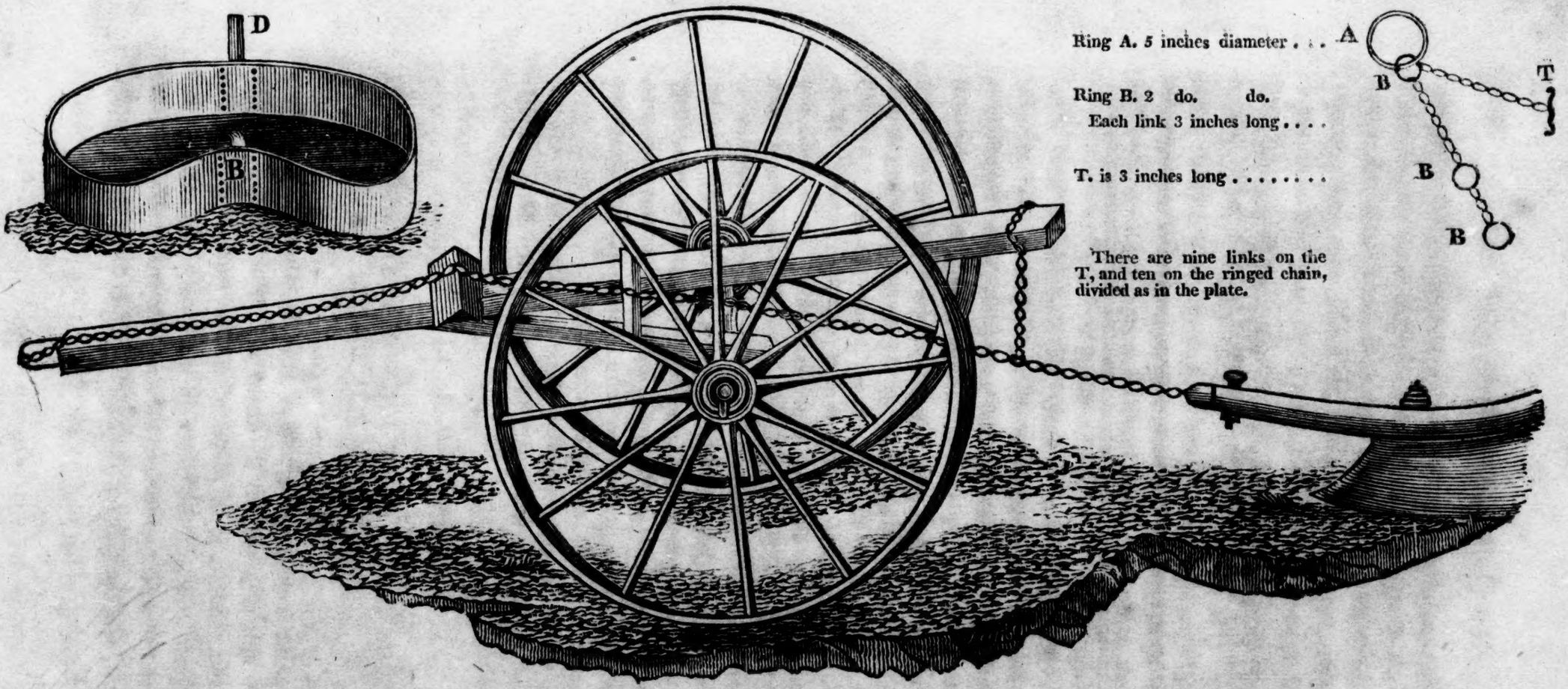

FIG....III.

Ring A. 5 inches diameter . . .

Ring B. 2 do. do.

Each link 3 inches long . . . .

T. is 3 inches long . . . . . .

There are nine links on the T, and ten on the ringed chain, divided as in the plate.

LUKE JOHNSON'S APPARATUS.